

PATENT COOPERATION TREATY

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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE
in its capacity as elected Office

Date of mailing (day/month/year) 20 April 2001 (20.04.01)	
International application No. PCT/NL00/00500	Applicant's or agent's file reference 99.1097 WO
International filing date (day/month/year) 17 July 2000 (17.07.00)	Priority date (day/month/year) 16 July 1999 (16.07.99)
Applicant VAN LOEN, Leonardus, Lambertus	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
15 February 2001 (15.02.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer S. Mafla Telephone No.: (41-22) 338.83.38
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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 99.1097 WO	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/NL 00/ 00500	International filing date (day/month/year) 17/07/2000	(Earliest) Priority Date (day/month/year) 16/07/1999
Applicant VAN LOEN TECHNIEK B.V.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of Invention is lacking** (see Box II).

4. With regard to the **title**,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

3B

None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT 00/00500

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A01B45/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 966 239 A (HUTCHISON) 30 October 1990 (1990-10-30) column 7, line 67 -column 8, line 13; figures	1,2
Y		3-6
A		7
Y	US 5 626 195 A (DOVER) 6 May 1997 (1997-05-06) column 5, line 41 - line 43; figures	3-6
X	US 3 807 505 A (NUNES) 30 April 1974 (1974-04-30) figures	1,2
A	US 3 429 377 A (NUNES) 25 February 1969 (1969-02-25) figures	7

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

18 October 2000

Date of mailing of the international search report

26/10/2000

Name and mailing address of the ISA

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Walvoort, B

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT 00/00500

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4966239 A	30-10-1990	NONE	
US 5626195 A	06-05-1997	NONE	
US 3807505 A	30-04-1974	NONE	
US 3429377 A	25-02-1969	NONE	

Device for the harvesting of cultivated turfs.

This invention relates to a device for the harvesting of cultivated turfs, comprising a mobile chassis with a first knife that is capable of cutting a cultivated turf free from a field, and a second knife that is capable of chopping the cultivated turf in a direction that is transverse to the direction of travel, whereby the second knife is equipped with electronically controlled mechanisms that allow the second knife to work into the cultivated turf when a desired turf length has been reached, and where transport mechanisms are present near to the first knife to collect the cut away cultivated turf and to carry it away.

Such a device is mainly used for the harvesting of cultivated turfs. A known device for the harvesting of grass turfs contains a chassis that is possibly self-propelled and contains a first knife on the front side, when viewed in the direction of travel, for cutting away a cultivated turf of a certain width and thickness from the field. The knife thus grasps at the desired thickness below ground level, while a drum rolls over the field next to the knife in order to enclose the cultivated turf between the knife and the drum so that a uniform thickness is obtained. Moreover, the device contains a second knife that is activated after the desired length of grass turf has been cut away, in order to chop the cultivated turf transverse to the longitudinal direction. The cultivated turf that has been harvested to the desired length is guided behind the first knife to a means of transport in the form of a conveyor belt that carries it away. In the meantime, the next grass turf is already cut away.

The known device operates automatically to a certain extent since the second knife rests under considerable spring tension on a cam disc and is always released when this cam disc turns, where the cam disc is linked to the drum via a chain drive. After an exact predetermined number of revolutions of the drum, the second knife is activated and the harvested cultivated turf is chopped. A drawback of this is that the transition to a different cultivated turf length requires relatively major adjustment of the device since in order to achieve this, a different gear ratio must be obtained in the chain drive. In practice, this means that the existing gearwheels must be removed in order to make

room for other gearwheels. This not only takes time and results in the device being out of service, but is above all relatively inaccurate since only lengths that match a specific gear ratio can be used. In practice, it is often desirable to adjust the length of the grass turf rather accurately in order to ensure that the diameter of a roll of turf is virtually
5 constant. If, during the harvesting, due to the subsoil, a different depth is used for the first knife, this means that a different length must also be chosen in order to obtain the same diameter. This cannot, or is almost impossible to achieve using the known device.

Moreover, the known device is rather inaccurate since the drum often slips due to the
10 resistance that the drum encounters in the chain drive and the limited friction on the field. This results in the harvested cultivated turf having a greater length than was intended. This is in any event what happens to the cultivated turf that is first to be harvested after the device starts operating. The distance between the drum and the second knife will inevitably cause this turf harvested over this distance to be too long,
15 with this having to be manually corrected and resulting in rejection of the relevant cultivated turf part.

This invention is intended, in a device of the type mentioned in the introduction, to ensure that these disadvantages are barely apparent, and in particular, to ensure that a
20 fine adjustment is available for the harvesting length of the cultivated turf.

In order to attain this objective, according to the invention, a device of the type mentioned in the introduction, is characterised in that an electronic sensor installed near to a conveyor track for the cultivated turf is at least capable of recording a size for a
25 length of passing cultivated turf and producing this as an electronic signal, and that the sensor is linked by electronic means to the electronically controlled mechanisms for the second knife in order to release the second knife upon reaching a predetermined cultivated turf length. Thus the invention provides a sensor that directly or indirectly measures the length of the passing cultivated turf, unlike the known device where the
30 rotation of the drum essentially represents a displacement of the device as a whole. Thus, the device according to the invention, the cultivated turf that is first to be

harvested will be processed in the same way as successive cultivated turfs. Since measuring takes place after the harvesting, instead of before as is the case for the known device, the device according to the invention is thus much less susceptible to stretching and shrinking of the harvested turfs that can result from a difference in speed between the discharge rates of the transport mechanisms and the driving speed of the device as a whole. In accordance with the invention, the length of the grass turf can be recorded as the grass turf is ultimately delivered. Since the invention is based on an electronic sensor and the same transmission to the second knife, measuring can take place virtually without any friction, and the cultivated turf can be adjusted electronically to any desired length, without having to take the device out of service to do this.

A preferred embodiment of the device according to the invention is characterised in that the sensor is linked to the electronically controlled mechanisms via the medium of a central processing unit. The central processing unit enables other relevant parameters to be taken into account, such as the actual thickness of the cultivated turf, so that an optimal end product can be obtained.

In a particular embodiment, the device according to the invention is characterised in that the electronic sensor contains a measuring wheel to rest on a passing cultivated turf and to be driven by it, and that a sensor is linked to the measuring wheel that records a rotation of the measuring wheel and produces an electronic signal. In this case, the harvested cultivated turf is directly measured in order to obtain an extremely accurate measuring result. This measuring result is sent to the central processing unit for further processing.

A preferred embodiment of the device is characterised in that the sensor is capable of recording the direction of rotation of the measuring wheel. Since the sensor is capable of not only sensing a rotation, but also the direction of rotation of the measuring wheel, the travelling forwards and backwards and any shocks in the transportation of the cultivated turf can be taken into account, so that the final length of the cultivated turf is not altered.

A particular embodiment, the device according to the invention is, in this respect, characterised in that the sensor contains an incremental pulse generator.

Another preferred embodiment of the device according to the invention is characterised in that an electronic means of detection is used to record the presence of a cultivated turf in the conveyor track and to produce this as an electronic signal. This results in not only the length of the harvested cultivated turf being measured, but the presence of the cultivated turf in the conveyor track also being detected, and this is produced as an electronic signal. In particular, the length of the harvested cultivated turf is determined, indirectly, if not on the cultivated turf itself, thus allowing corrections to be made for the cases or periods when a cultivated turf is not in the conveyor track. This is in particular relevant for a length correction for the first cultivated turf to be harvested, and for a correction for gaps between consecutive cultivated turfs resulting from the occurrence of stretching and shrinking as previously described.

In a particular embodiment, the device according to the invention is characterised in the aforementioned context in that the sensor is essentially commonly suspended in a direction transverse to the conveyor track for the cultivated turf in order to be raised from a point of departure when a cultivated turf passes, and in that the means of detection is linked to a suspension attached to a sensor. This embodiment enables the presence or non-presence of a cultivated turf to be recorded in a relatively simple yet not less efficient manner. As soon as the cultivated turf is no longer present, the suspension will return to the point of departure and touch the means of detection that produces this as an electronic signal. In another embodiment, the device according to the invention is characterised in that the means of detection contains an electric switch that is capable of working together with the suspension attached to the sensor, at least when leaving its point of departure.

Because cultivated turfs are often rolled up after they have been harvested, with this roll preferably having a constant diameter, not only the length of the cultivated turf is important, but the thickness of the turf also plays a role. With this in mind, another

embodiment of the device according to the invention is characterised in that means are installed next to a conveyor track for the cultivated turf in order to determine the thickness of a harvested cultivated turf and to produce this as an electronic value.

5 Another embodiment of the device according to the invention is characterised in that the sensor is commonly suspended in a direction transverse to the conveyor track and in that the means for determining the thickness of the cultivated turf contains a raise detector that is capable of recording an amount of raising of the sensor and producing this as an electronic value. The amount of raising provides a guideline for the actual thickness of
10 the cultivated turf and can, as such, produce an electronic value, for example to a central processing unit. Thus thickness variations in the cultivated turfs can be taken into account completely automatically, so that a constant diameter is attained when a turf is rolled up. Another particular embodiment of the device according to the invention is characterised in that the raise detector contains a slide resistor that is linked to the
15 sensor. The raising of the measuring wheel thus results in a corresponding sliding in or sliding out of the slide resistor and the associated change in resistance that can be processed electronically.

Another embodiment of the device according to the invention is characterised in that the
20 first knife is adjustable and is equipped with a means of adjustment that can be controlled by a central processing unit. Thus not only the length of the cultivated turf is controlled, but electronic control of the thickness is also possible with an electronic link between both in order to ensure that the final diameter of the rolled up product is constant. Thus, an extremely user-friendly system is obtained where, in practice, only
25 one operator is required.

The means of adjustment can be implemented in several ways, for example, via the medium of a hydraulically or pneumatically controlled pressure cylinder. An
embodiment of the device according to the invention that has been proven in practice is,
30 in this respect, characterised in that the means of adjustment contains an electronically controlled actuator that is linked to the first knife. The actuator can for example be a

spindle that is driven by an electrical stepper motor or an adjustment cylinder that is possibly hydraulic. In both cases, the first knife can be accurately adjusted to the desired depth.

5 The electronic control mechanism for the second knife can also be implemented in various ways. Another particular embodiment of the device according to the invention is also characterised in that the electronically controlled mechanisms for the second knife contains an electronic clutch that is incorporated in a transmission between a drive for the chassis and a cam disc on which the second knife rests under spring pressure. As
10 soon as the clutch is activated, the cam disc will be driven and the second knife will be released so that the cultivated turf is chopped. This can for example be controlled by a central processing unit.

The invention will be further explained based on an example of an embodiment and an
15 associated illustration. The illustration shows:

- figure 1 a side view of an embodiment of the device according to the invention;
- figure 2 a cross-sectional view through a first part of the device in figure 1;
- figure 3A a cross-sectional view through a second part of the device in figure 1 in a first position;
- 20 figure 3B a cross-sectional view through a second part of the device in figure 1 in a second position;
- figure 3C a cross-sectional view through a second part of the device in figure 1 in a third position;
- figure 4 a schematic representation of an electronic circuit for the device in figure
25 1; and
- figure 5 a switching diagram for the circuit in figure 4.

The figures are purely schematic and are not drawn to the same scale. In particular, for the sake of clarity, some of the dimensions have been greatly exaggerated. In the figures, the same reference number is used as far as possible for corresponding parts.

Figure 1 shows a device for the harvesting of cultivated turfs in the form of a mobile chassis 1 that is connected to an existing tractor 2. As an alternative, the device can also be self-propelled, in which case the tractor and the device form a single integrated entity. The cultivated turfs to be harvested are in field 3. Leaves and other waste are removed from these turfs by means of a rotating roller brush 5. Moreover, the device has a side guide 4 that rests under spring tension against an edge of the surface and is linked to the steering device of the device. Thus the device is capable by itself of maintaining a course along the edge of the next track of cultivated turfs to be harvested, and the complete device can be entirely operated by only one operator. For the harvesting, the device 1 contains two knives that are incorporated within the plating of the device and this is shown in more detail in figure 2. The harvested cultivated turfs are carried away with the aid of a means of transport in the form of a conveyor belt 6 to a temporary storage location 7 where the turfs are unloaded. In practice, the turfs are rolled into rolls that have a more or less fixed diameter and stacked on a pallet at the unloading bay. When the pallet is completely full, it is removed from the device in order to be placed in the field or directly carried away.

The set of knives that is shown in cross-section in figure 2 contains a first knife 21 that grasps underneath the cultivated turf to be harvested 3 that will be referred to from here onwards as the harvesting knife. This knife 21 is adjustable and is equipped with an electronically controlled depth control mechanism that contains two operating rods 23, 24 and means of adjustment in the form of an actuator 25. The actuator 25 contains a hydraulic cylinder, but instead of an adjusting cylinder that is possibly hydraulic, an electrical spindle or another type of linear-operated medium can also be used. The actuator thus acts as a hinge around a pivot 253 on a first of two operating rods 23 that acts as a hinge around a pivot 233 and is connected with a part of a frame 20 of the device. The actuator 25 itself is also hinged on the other side of this rod 23 around a pivot 255 and connected to the frame. Transverse to the first operating position, a second of two operating rods 24 is hinged around a pivot 244 and connected to the first operating rod while this second operating rod supports the harvesting knife on its associated free end. Thus the harvesting knife 21 will move downwards if a piston rod

251 of the adjusting cylinder extends, and will be forced upwards if the piston rod 251 retracts. This allows the depth of the harvesting knife 21, and the subsequent thickness of the cultivated turfs 3 to be harvested, to be controlled relatively accurately by electrical means.

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In order to prevent the cultivated turf from creeping upwards while it is being cut away by the harvesting knife on the underside, a relatively heavy drum 30 rolls over the field 3 beside the harvesting knife 21 so that the turf is enclosed between the drum 30 and the knife 21. A conveyor belt 6 is located behind the harvesting knife 21 for guiding the harvested cultivated turf before it is carried away to the unloading bay 7.

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The device also has a second knife 22 for chopping the cultivated turf when it reaches the desired length. This knife 22 is capable of chopping transverse to the longitudinal direction of the cultivated turf and thus chopping in a single action. This knife, that will also be referred to from here onwards as the chopping knife, rests under considerable spring tension on a cam disc 42 by a spring 41 that is secured to a rotation axis 422. The cam disc 42 is linked to the drum via a chain drive 44 that is only schematically represented in the figure, with the medium of an electrically controlled clutch 45. The clutch 45 and the cam disc 42 are mutually adjusted so that the chopping knife 22 is always directly forced back to its highest position after the chopping of a cultivated turf, as shown in the figure. In this position, the clutch 45 disengages the drive 44 so that the chopping knife remains rigidly in this position until the clutch is activated and the cam disc is driven over this highest point. In that case, the spring tension of the spring 41 ensures that the chopping knife will separate the harvested cultivated turf almost instantaneously from the next cultivated turf.

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The device in this example is equipped with a fully automatic and accurately adjustable control for the length and thickness of the cultivated turf. This control incorporates a set of electronic sensors that are housed in an integrated unit that, as such, can be installed as a finished factory product or at a later date on a device for the harvesting of cultivated turfs. This unit is shown in detail in various stages in figures 3A and 3B and first of all

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contains an electronic sensor 80 that is located near to a conveyor track 60 for the cultivated turf, and is capable of recording the length of a passing cultivated turf 3 and producing this as an electronic value. In this case, this sensor 80 incorporates a measuring wheel 81 that is capable of resting on a passing cultivated turf 3 and being driven by it. For this, the measuring wheel 81 is incorporated in a common suspension 85 that is linked and hinged to a pivot 855 with a fixed part 200 of the chassis of the device. This suspension 85 rests under its own weight with the measuring wheel on a passing cultivated turf 3, as shown in figure 3B. This enables the measuring wheel 81 to be driven. A rotation sensor 82 in the form of an incremental pulse generator is linked to an end of an associated hub. This produces a series of pulses for each revolution of the measuring wheel. Each pulse represents a cultivated turf length $l=2\pi r/n$ where r is the radius of the measuring wheel and n is the number of pulses per rotation. In this case, a pulse generator is used that, in addition to detecting the rotation of the measuring wheel, also detects its direction of rotation, so that in the event of rotation in the opposite direction, a corresponding length is subtracted from the measuring result. Thus the length of a passing cultivated turf 3 is accurately derived from the number of pulses from the pulse generator. The pulse generator is linked by electronic means to a central processing unit 100 that in turn is linked to the electrical clutch 45. The central processing unit 100 incorporates an input means in the form of a numerical keyboard 101 and a checking window 102 that can be used to numerically set the desired cultivated turf length. When the desired length is reached, the central processing unit sends a signal to the clutch 45 that in turn re-engages the chain drive 44 to the cam disc 42 so that the chopping knife 22 is released and almost instantaneously chops the cultivated turf to the desired length. The processing unit also incorporates a manual switch 103 in the form of a pushbutton that enables the operator to operate the chopping knife 22 at any desired moment and to chop the cultivated turf 3. This is for example desirable if a visual inspection by the operator detects that the quality of the cultivated turf is inferior, so harvesting of the good cultivated turfs can be resumed immediately after passing this part.

In order to prevent the sensor from continuing to count when a cultivated turf 3 is not present in the conveyor track 60, the unit contains an additional means of detection to detect whether or not a cultivated turf is present in the conveyor track 60. This means of detection incorporates an electrical switch 90 that is capable of operating in conjunction with the sensor 80. In the situation shown in figure 3A, where a cultivated turf is not present underneath the measuring wheel 81, the full weight of the sensor 80 rests on the switch 90 so that it is depressed. However, as soon as a cultivated turf passes underneath the measuring wheel 81 (see figure 3B), the sensor is raised from this point of departure and the switch is released. Thus the position of the switch provides an indication of whether or not a cultivated turf 3 is present in the conveyor track, with it being possible for this to be electronically detected, which can be supplied to the central processing unit 100 that is linked to the switch. If the switch 90 is depressed, the central processing unit 100 will temporarily stop measuring the length, and will resume this task immediately after the switch has been released. Thus measuring errors resulting from interruptions between consecutive cultivated turfs, or from the first cultivated turf to be harvested, are prevented.

Moreover, the unit incorporates a means for measuring a thickness of a freshly harvested turf 3 and to possibly feed this information back to the depth controller 25 for the harvesting knife 21. This means incorporates a raise detector that records the amount by which the sensor 80 is raised. The raise detector consists of a slide resistor 95,96 that is located between the sensor 80 and the part 201 of the chassis and also contains the switch 90. The slide resistor consists of a housing 95 in which a sliding electrode slides over a wound resistance element. As the sensor is raised by a passing cultivated turf from the point of departure shown in figure 3A, this electrode 96 will move further into the housing so that the resistance decreases. A virtually linear relationship exists between the amount by which the sensor is raised and the resistance of the slide resistor, so that this resistance provides a relatively direct indication of the actual thickness of the cultivated turf. If the measured thickness deviates at any moment from a value programmed via the input means, then the central processing unit will send a signal to

the actuator requesting it to compensate for the deviation so that fully automatic thickness control is possible.

In order to ensure that the relatively vulnerable resistance element 95 cannot become
5 damaged if the sensor is raised further than the sliding electrode allows, the part of the
chassis 201 against which the sliding electrode 96 rests is separately hinged around a
pivot 210 connected to the chassis 200. A stop (not illustrated) is located between this
part 201 and the sensor so that when the sliding electrode 96 reaches the end of its travel
in the resistance housing 95, this part 201 is raised by the sensor 80 in order to prevent
10 mechanical overloading of the slide resistor 95,96. This situation is shown in figure 3C.

By way of an example, figure 5 shows a switching diagram as it is implemented by the
central processing unit. The horizontal axis always shows the progress of time. Line A
on figure 5 vertically shows the length of the cultivated turf as it is detected by the
15 sensor 80. At the moment t_0 , the device is activated and harvesting is commenced. At
moment t_1 , the first cultivated turf arrives at the sensor 80 so that this is raised and
releases the switch 90. This is the signal for the central processing unit 100 to start a
length measurement based on the pulses that are provided by the pulse generator 82 of
the sensor. In order to reach a cultivated turf length P_1 , upon reaching a length P_1-P_2 , a
20 signal pulse is given by the processing unit 100 to the electrical clutch 45 in order to
release the chopping knife 22. In this respect, P_2 is the lateral distance between the
sensor 80 and the chopping knife 22. This chopping signal to the clutch 45 is shown on
line E in figure 5. In the meantime, the slide resistor 95 constantly monitors the
thickness of the cultivated turf 3.

25 After the chopping signal has been given, the sensor continues to count for a period (t_s)
until the actual length (P_1) has been reached, after which a reset pulse (see figure D) is
given to reset the length measurement to zero. Then the next measurement starts for the
next cultivated turf, at least when a cultivated turf is detected underneath the sensor. As
30 long as this is not the case, which can be seen from the position of the switch 90 that is
schematically shown on line C of figure 5, the length measurement for the next

cultivated turf will be postponed. Line B in figure 5 schematically shows the presence of the cultivated turf. Thus by unlinking the starting of new counting from the chopping signal, measurement only takes place if a cultivated turf is actually present and the system is able to cope with interruptions between successive cultivated turfs. In the figure, this is the case during the periods tx1 and tx2.

Thus the invention provides a device for the harvesting of cultivated turfs that controls the harvesting virtually completely automatically and can thus be operated in practice by only one operator. All of the sensors used for this are housed in a compact unit that can be easily installed as a finished factory product or at a later date on an existing device. The central processing unit with its operating means is for example housed in the cabin of the device.

Whilst the invention for this has only been explained in more detail purely based on an example of an embodiment, it will be evident that the invention is in no way restricted to this. On the contrary, many variants and representations of the invention are possible for an average tradesman.

Claims:

1. Device for the harvesting of cultivated turfs, comprising a mobile chassis with a first knife that is capable of cutting a cultivated turf free from a field and a second knife
5 that is capable of cutting off the cultivated turf in a direction that is transverse to the direction of travel, whereby the second knife is equipped with electronically controlled mechanisms that allow the second knife to work into the cultivated turf when a desired turf length has been reached and where transport mechanisms are present near the first knife to collect the cut away cultivated turf and to carry it away, characterised in that an
10 electronic sensor installed near a conveyor track for the cultivated turf is at least capable of recording a size for a length of passing cultivated turf and producing this as an electronic signal and that the sensor is linked by electronic means to the electronically controlled mechanisms for the second knife in order to release the second knife upon reaching a predetermined cultivated turf length.
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2. Device according to claim 1 characterised in that the sensor is linked to the electronically controlled mechanisms via the medium of a central processing unit.
3. Device according to claim 2 characterised in that the electronic sensor contains a
20 measuring wheel to rest on a passing cultivated turf and to be driven, and that a sensor linked to the measuring wheel records a rotation of the measuring wheel and produces an electronic signal
4. Device according to claim 3 characterised in that the sensor is capable of
25 recording a rotation direction of the measuring wheel.
5. Device according to claim 3 or 4 characterised in that the sensor includes an incremental pulse generator.

6. Device according to one of the aforementioned claims characterised in that electronic detection means are applied to record the presence of a cultivated turf in the conveyor track and to produce this as an electronic signal.

5 7. Device according to claim 6 characterised in that the sensor is essentially commonly suspended in a direction transverse to the conveyor track for the cultivated turf in order to be raised from a point of departure when a cultivated turf passes, and in that the means of detection is linked to a suspension attached to a sensor.

10 8. Device according to claim 7 characterised in that the means of detection contains an electronic switch that is capable of working together with the suspension attached to the sensor, at least when leaving its point of departure.

15 9. Device according to one of the aforementioned claims characterised in that means are installed next to a conveyor track for the cultivated turf in order to determine the thickness of the cultivated turf and to produce this as an electronic value.

10. Device according to claim 9 characterised in that the sensor is commonly suspended in a direction transverse to the conveyor track and in that the means for
20 determining the thickness of the cultivated turf contains a raise detector that is capable of recording an amount of raising of the sensor and producing this as an electronic value.

25 11. Device according to claim 10 characterised in that the raise detector contains a slide resistor that is linked to the sensor.

12. Device according to one of the aforementioned claims characterised in that the first knife is adjustable and is equipped with a means of adjustment that can be controlled by a central processing unit.

13. Device according to claim 12 characterised in that the means of adjustment contains an electronically controlled actuator connected to the first knife.
14. Device according to one of the aforementioned claims characterised in that the
5 electronically controlled mechanisms for the second knife contains an electronic clutch that is incorporated in a transmission between a drive for the chassis and a cam disc on which the second knife rests under spring pressure.

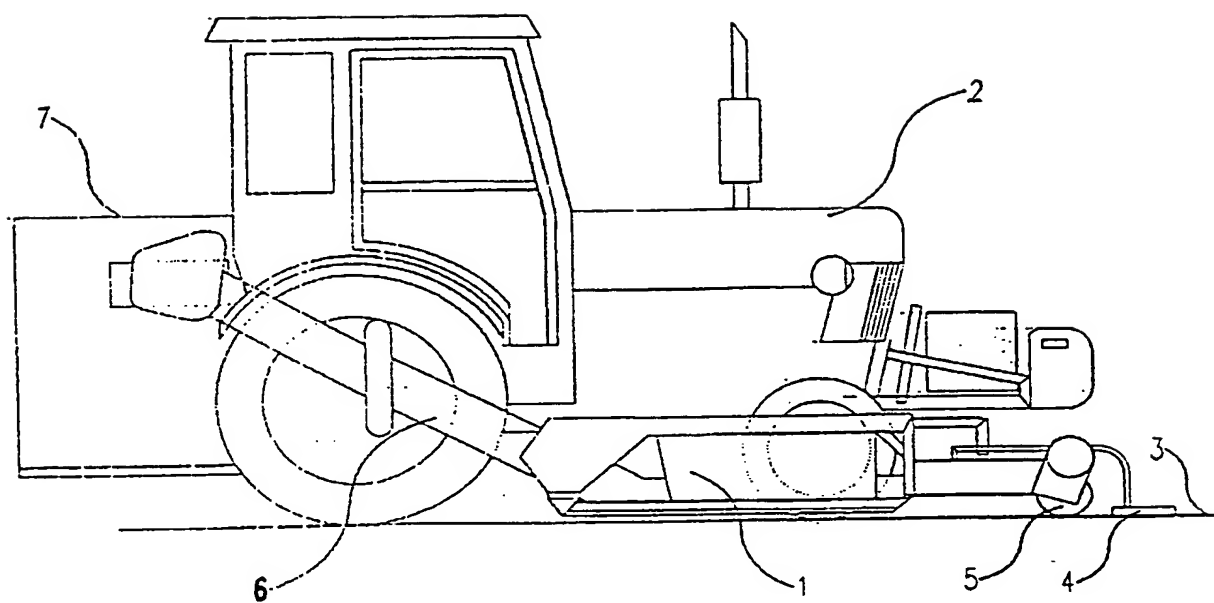


Fig.1

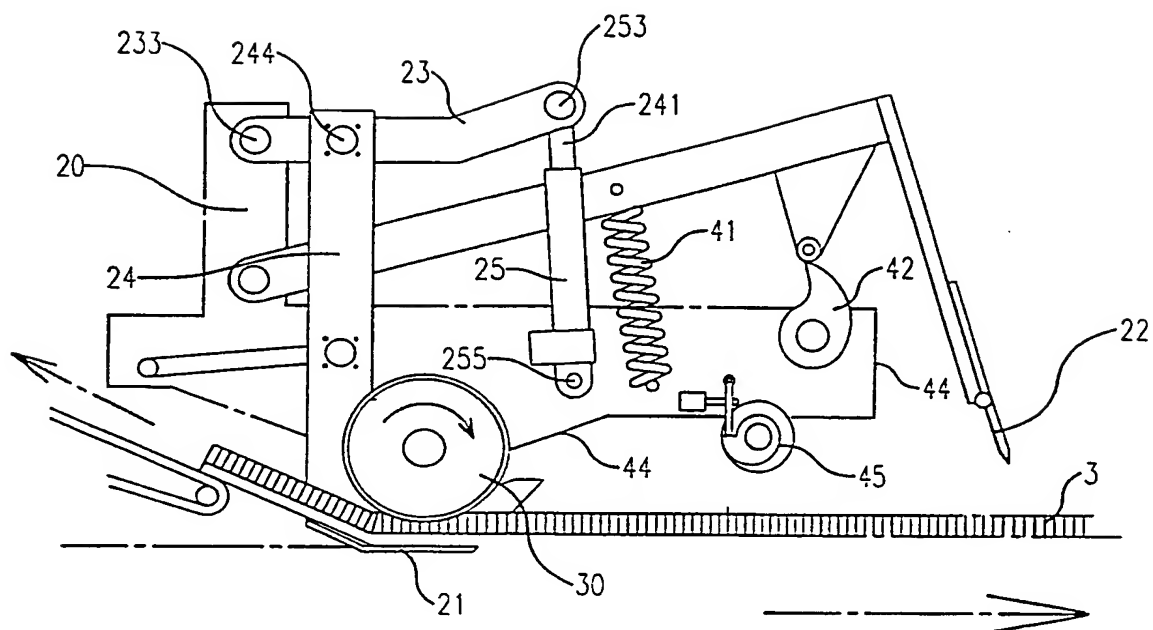


Fig.2

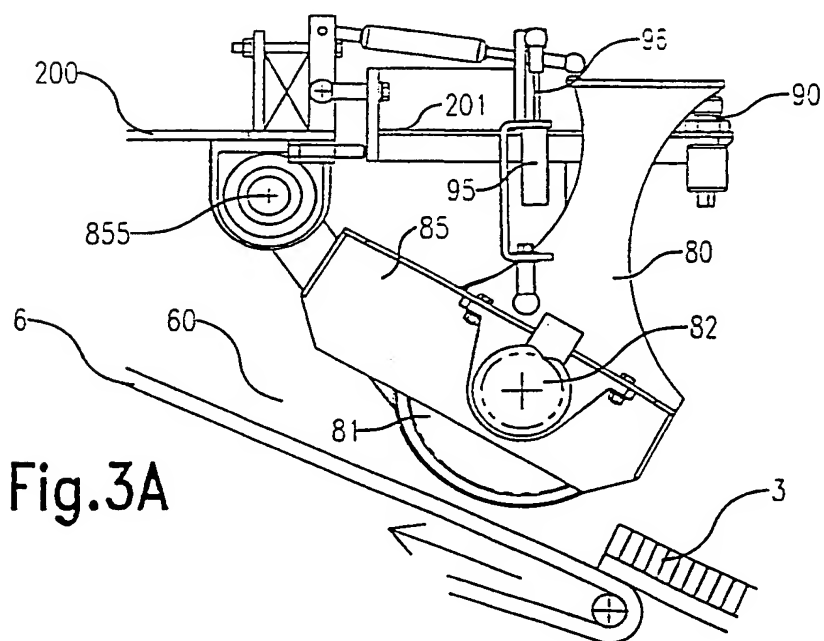
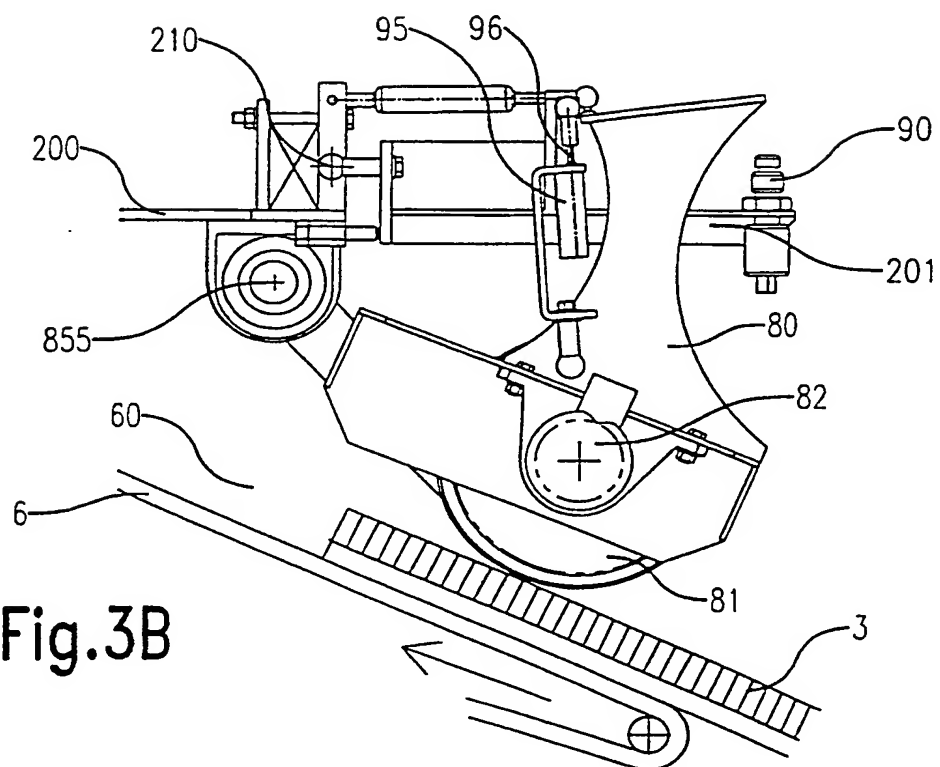


Fig.3A



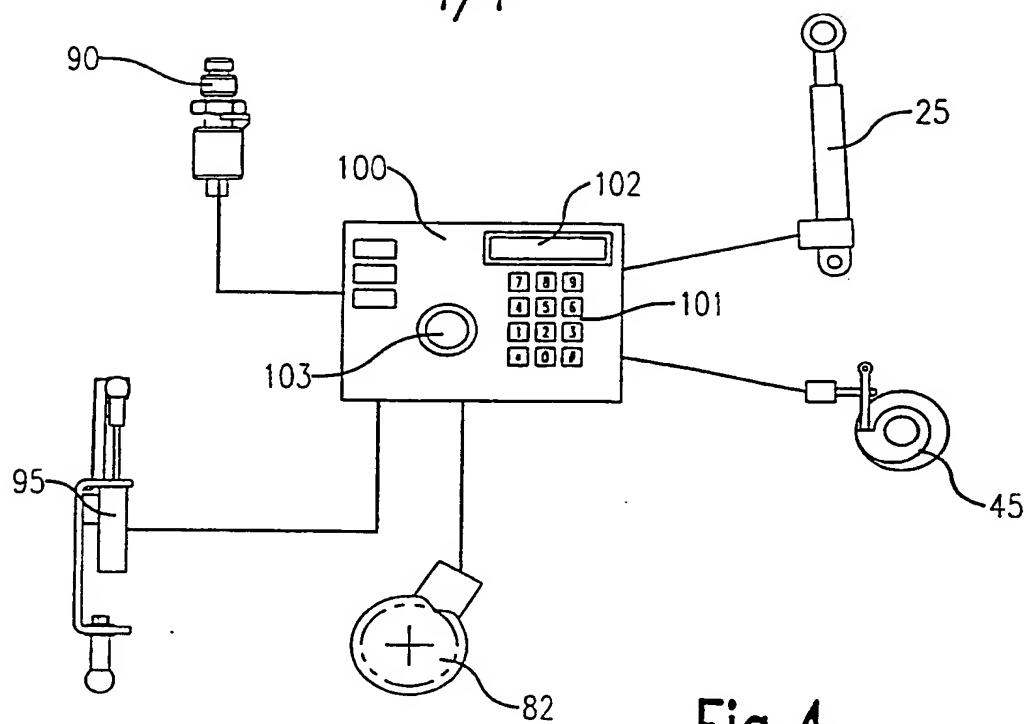


Fig. 4

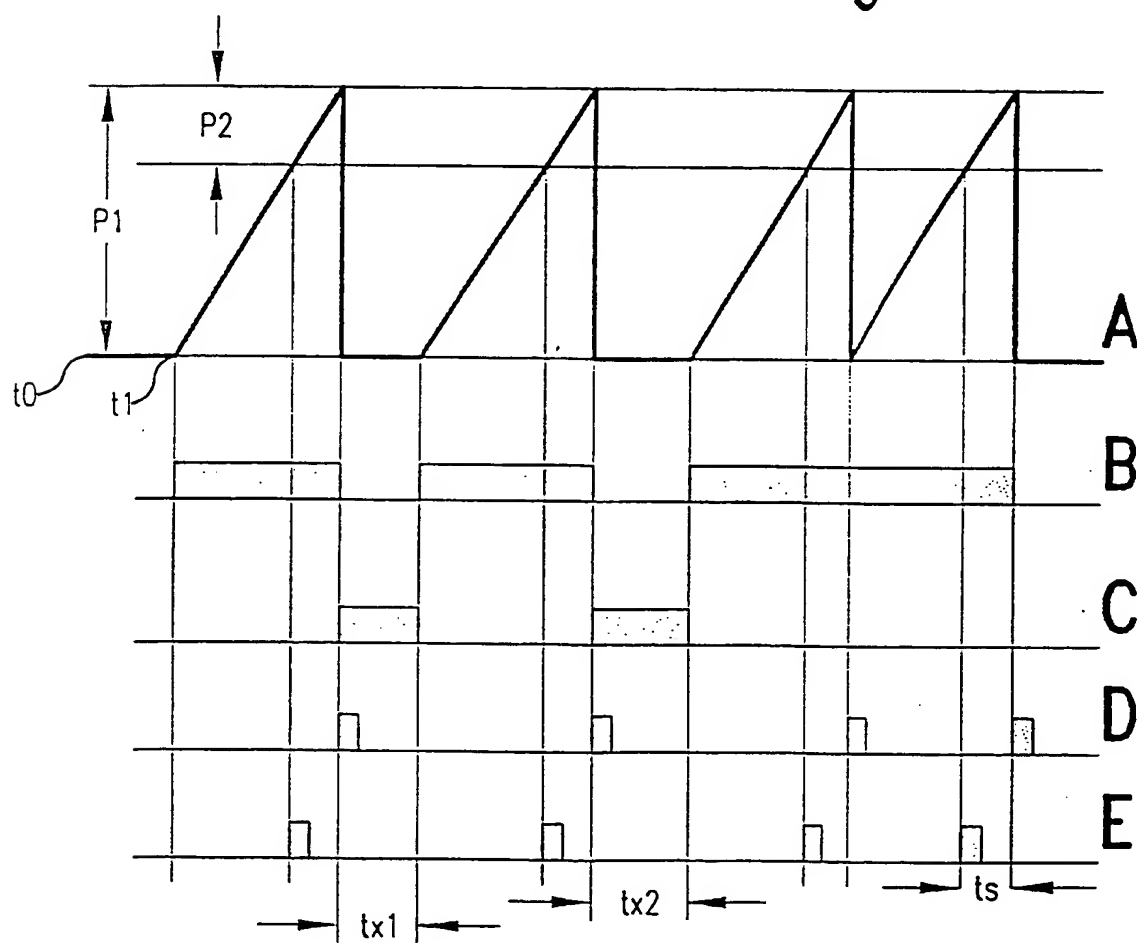


Fig. 5

INTERNATIONAL SEARCH REPORT

Int. Application No.

PCT/NL 00/00500

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A01B45/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 966 239 A (HUTCHISON) 30 October 1990 (1990-10-30) column 7, line 67 -column 8, line 13; figures	1,2
Y A	---	3-6 7
Y	US 5 626 195 A (DOVER) 6 May 1997 (1997-05-06) column 5, line 41 - line 43; figures	3-6
X	---	
X	US 3 807 505 A (NUNES) 30 April 1974 (1974-04-30) figures	1,2
A	---	
A	US 3 429 377 A (NUNES) 25 February 1969 (1969-02-25) figures	7

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

18 October 2000

Date of mailing of the international search report

26/10/2000

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. Application No

PCT/NL 00/00500

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4966239 A	30-10-1990	NONE	
US 5626195 A	06-05-1997	NONE	
US 3807505 A	30-04-1974	NONE	
US 3429377 A	25-02-1969	NONE	

PCT



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 99.1097 WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/NL00/00500	International filing date (day/month/year) 17/07/2000	Priority date (day/month/year) 16/07/1999
International Patent Classification (IPC) or national classification and IPC A01B45/04		
Applicant VAN LOEN TECHNIEK B.V. et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 14 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 15/02/2001	Date of completion of this report 16.10.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Van Woensel, G Telephone No. +49 89 2399 2089 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NL00/00500

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-12 as received on 17/09/2001 with letter of 13/09/2001

Claims, No.:

1-14 as received on 17/09/2001 with letter of 13/09/2001

Drawings, sheets:

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/NL00/00500

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-14
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-14
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-14
	No:	Claims	

2. Citations and explanations see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/NL00/00500

Ad V

- 1.1 Present claim 1 is new and involves an inventive step since none of the prior art documents discloses or suggests that a sod be measured electronically after it has been harvested in order to measure the correct length of the sods. To install an electronic sensor near the conveyor track for the harvested sods is therefore an inventive solution to the problem posed.
- 1.2 Claims 2-14 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.
- 1.3 Claims 1-14 are considered to be industrially applicable.
- 1.4 The present application therefore meets the requirements of Article 33 PCT.

Sod harvesting device.

This invention relates to a sod harvesting device, comprising a mobile chassis with a first knife that is capable of cutting a sod free from a field, and a second knife that is capable of
5 chopping the sod in a direction that is transverse to the direction of travel, whereby the second knife is equipped with electronically controlled mechanisms that allow the second knife to work into the sod when a desired sod length has been reached, and where transport mechanisms are present near to the first knife to collect the cut away sod and to carry it away.

10 Such a device is mainly used for the harvesting of cultivated turfs. A known device for the harvesting of grass turfs contains a chassis that is possibly self-propelled and contains a first knife on the front side, when viewed in the direction of travel, for cutting away a sod of a certain width and thickness from the field. The knife thus grasps at the desired thickness below ground level, while a drum rolls over the field next to the knife in order to enclose the
15 sod between the knife and the drum so that a uniform thickness is obtained. Moreover, the device contains a second knife that is activated after the desired length of grass turf has been cut away, in order to chop the sod transverse to the longitudinal direction. The sod that has been harvested to the desired length is guided behind the first knife to a means of transport in the form of a conveyor belt that carries it away. In the meantime, the next grass turf is already
20 cut away.

The known device operates automatically to a certain extent since the second knife rests under considerable spring tension on a cam disc and is always released when this cam disc turns, where the cam disc is linked to the drum via a chain drive. After an exact predetermined
25 number of revolutions of the drum, the second knife is activated and the harvested sod is chopped. A drawback of this is that the transition to a different sod length requires relatively major adjustment of the device since in order to achieve this, a different gear ratio must be obtained in the chain drive. In practice, this means that the existing gear wheels must be removed in order to make room for other gear wheels. This not only takes time and results in
30 the device being out of service, but is above all relatively inaccurate since only lengths that match a specific gear ratio can be used. In practice, it is often desirable to adjust the length of

-2-

the grass turf rather accurately in order to ensure that the diameter of a roll of turf is virtually constant. If, during the harvesting, due to the subsoil, a different depth is used for the first knife, this means that a different length must also be chosen in order to obtain the same diameter. This cannot, or is almost impossible to achieve using the known device.

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Moreover, the known device is rather inaccurate since the drum often slips due to the resistance that the drum encounters in the chain drive and the limited friction on the field. This results in the harvested sod having a greater length than was intended. This is in any event what happens to the sod that is first to be harvested after the device starts operating. The distance between the drum and the second knife will inevitably cause this sod harvested over this distance to be too long, with this having to be manually corrected and resulting in rejection of the relevant sod part.

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A somewhat better construction is revealed by the sod harvesting apparatus disclosed in US patent USP 4.966.239. Also this apparatus comprises a harvesting knife in the front section of the machine capable of cutting loose a sod from the field together with a cutting knife which is capable of cutting the sod in the traverse direction over it's entire thickness once the desired length is obtained. Different from the prior art device described hereinbefore, the apparatus known from this US patent comprises electronic means for determining the length of sod and an electronic signal is given to the cutting knife in order to cut the sod . These electronic means consist of a inductive, eddy current pick up which counts the number of passing teeth on a gear in the harvesting transmission and sends pulses to an electronic pre-determining counter. The counter sends a signal to actuation means of the cutting knife once a programmed number of pulses is exceeded, which causes the sod being cut. Although this allows for more precise, finer and especially much more easily finer setting of the desired length compared to the previously described prior art device, also this device does not take into account any irregularities which may arise in the harvested product, such as interruptions and temporary variations in the length of the product due to stretching and crimping. In stead just the number of revolutions of the gear wheel is taken as a basis for activating the cutting knife.

-3-

This invention is intended, in a device of the type mentioned in the introduction, to ensure that these disadvantages are barely apparent, and in particular, to ensure that a fine adjustment is available for the harvested sod length.

5 In order to attain this objective, according to the invention, a device of the type mentioned in the introduction, is characterised in that an electronic sensor installed near to a conveyor track for the sod is at least capable of recording a size for a length of passing sod and producing this as an electronic signal, and that the sensor is linked by electronic means to the electronically controlled mechanisms for the second knife in order to release the second knife upon reaching
10 a predetermined sod length. Thus the invention provides a sensor that directly or indirectly measures the length of the passing sod, unlike the known device where the rotation of the drum essentially represents a displacement of the device as a whole. Thus, in the device according to the invention, the sod that is first to be harvested will be processed in the same way as successive sods. Since measuring takes place after the harvesting, instead of before
15 as is the case for the known device, the device according to the invention is thus much less susceptible to stretching and shrinking of the harvested sods that can result from a difference in speed between the discharge rates of the transport mechanisms and the driving speed of the device as a whole. In accordance with the invention, the length of the grass turf can be recorded as the grass turf is ultimately delivered. Since the invention is based on an electronic
20 sensor and the same transmission to the second knife, measuring can take place virtually without any friction, and the sod can be adjusted electronically to any desired length, without having to take the device out of service to do this.

A preferred embodiment of the device according to the invention is characterised in that the
25 sensor is linked to the electronically controlled mechanisms via the medium of a central processing unit. The central processing unit enables other relevant parameters to be taken into account, such as the actual thickness of the sod, so that an optimal end product can be obtained.

-4-

In a particular embodiment, the device according to the invention is characterised in that the electronic sensor contains a measuring wheel to rest on a passing sod and to be driven by it, and that a sensor is linked to the measuring wheel that records a rotation of the measuring wheel and produces an electronic signal. In this case, the harvested sod is directly measured in order to obtain an extremely accurate measuring result. This measuring result is sent to the central processing unit for further processing.

A preferred embodiment of the device is characterised in that the sensor is capable of recording the direction of rotation of the measuring wheel. Since the sensor is capable of not only sensing a rotation, but also the direction of rotation of the measuring wheel, the travelling forwards and backwards and any shocks in the transportation of the sod can be taken into account, so that the final length of the sod is not altered. A particular embodiment, the device according to the invention is, in this respect, characterised in that the sensor contains an incremental pulse generator.

Another preferred embodiment of the device according to the invention is characterised in that an electronic means of detection is used to record the presence of a sod in the conveyor track and to produce this as an electronic signal. This results in not only the length of the harvested sod being measured, but the presence of the sod in the conveyor track also being detected, and this is produced as an electronic signal. In particular, the length of the harvested sod is determined, indirectly, if not on the sod itself, thus allowing corrections to be made for the cases or periods when a sod is not in the conveyor track. This is in particular relevant for a length correction for the first sod to be harvested, and for a correction for gaps between consecutive sod s resulting from the occurrence of stretching and shrinking as previously described.

In a particular embodiment, the device according to the invention is characterised in the aforementioned context in that the sensor is essentially commonly suspended in a direction transverse to the conveyor track for the sod in order to be raised from a point of departure when a sod passes, and in that the means of detection is linked to a suspension attached to a

-5-

sensor. This embodiment enables the presence or non-presence of a sod to be recorded in a relatively simple yet not less efficient manner. As soon as the sod is no longer present, the suspension will return to the point of departure and touch the means of detection that produces this as an electronic signal. In another embodiment, the device according to the invention is characterised in that the means of detection contains an electric switch that is capable of working together with the suspension attached to the sensor, at least when leaving its point of departure.

Because sod s are often rolled up after they have been harvested, with this roll preferably having a constant diameter, not only the length of the sod is important, but the thickness of the sod also plays a role. With this in mind, another embodiment of the device according to the invention is characterised in that means are installed next to a conveyor track for the sod in order to determine the thickness of a harvested sod and to produce this as an electronic value.

Another embodiment of the device according to the invention is characterised in that the sensor is commonly suspended in a direction transverse to the conveyor track and in that the means for determining the thickness of the sod contains a raise detector that is capable of recording an amount of raising of the sensor and producing this as an electronic value. The amount of raising provides a guideline for the actual thickness of the sod and can, as such, produce an electronic value, for example to a central processing unit. Thus thickness variations in the sod s can be taken into account completely automatically, so that a constant diameter is attained when a sod is rolled up. Another particular embodiment of the device according to the invention is characterised in that the raise detector contains a slide resistor that is linked to the sensor. The raising of the measuring wheel thus results in a corresponding sliding in or sliding out of the slide resistor and the associated change in resistance that can be processed electronically.

Another embodiment of the device according to the invention is characterised in that the first knife is adjustable and is equipped with a means of adjustment that can be controlled by a central processing unit. Thus not only the length of the sod is controlled, but electronic control

-6-

of the thickness is also possible with an electronic link between both in order to ensure that the final diameter of the rolled up product is constant. Thus, an extremely user-friendly system is obtained where, in practice, only one operator is required.

5 The means of adjustment can be implemented in several ways, for example, via the medium of a hydraulically or pneumatically controlled pressure cylinder. An embodiment of the device according to the invention that has been proven in practice is, in this respect, characterised in that the means of adjustment contains an electronically controlled actuator that is linked to the first knife. The actuator can for example be a spindle that is driven by an electrical stepper
10 motor or an adjustment cylinder that is possibly hydraulic. In both cases, the first knife can be accurately adjusted to the desired depth.

The electronic control mechanism for the second knife can also be implemented in various ways. Another particular embodiment of the device according to the invention is also
15 characterised in that the electronically controlled mechanisms for the second knife contains an electronic clutch that is incorporated in a transmission between a drive for the chassis and a cam disc on which the second knife rests under spring pressure. As soon as the clutch is activated, the cam disc will be driven and the second knife will be released so that the sod is chopped. This can for example be controlled by a central processing unit.

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The invention will be further explained based on an example of an embodiment and an associated illustration. The illustration shows:

- figure 1 a side view of an embodiment of the device according to the invention;
- figure 2 a cross-sectional view through a first part of the device in figure 1;
- 25 figure 3A a cross-sectional view through a second part of the device in figure 1 in a first position;
- figure 3B a cross-sectional view through a second part of the device in figure 1 in a second position;
- figure 3C a cross-sectional view through a second part of the device in figure 1 in a
30 third position;

-7-

figure 4 a schematic representation of an electronic circuit for the device in figure 1; and

figure 5 a switching diagram for the circuit in figure 4.

The figures are purely schematic and are not drawn to the same scale. In particular, for the sake of clarity, some of the dimensions have been greatly exaggerated. In the figures, the same reference number is used as far as possible for corresponding parts.

Figure 1 shows a sod harvesting device in the form of a mobile chassis 1 that is connected to an existing tractor 2. As an alternative, the device can also be self-propelled, in which case the tractor and the device form a single integrated entity. The sod s to be harvested are in field 3. Leaves and other waste are removed from these sod s by means of a rotating roller brush 5. Moreover, the device has a side guide 4 that rests under spring tension against an edge of the surface and is linked to the steering device of the device. Thus the device is capable by itself of maintaining a course along the edge of the next track of sod s to be harvested, and the complete device can be entirely operated by only one operator. For the harvesting, the device 1 contains two knives that are incorporated within the plating of the device and this is shown in more detail in figure 2. The harvested sod s are carried away with the aid of a means of transport in the form of a conveyor belt 6 to a temporary storage location 7 where the sod s are unloaded. In practice, the sod s are rolled into rolls that have a more or less fixed diameter and stacked on a pallet at the unloading bay. When the pallet is completely full, it is removed from the device in order to be placed in the field or directly carried away.

The set of knives that is shown in cross-section in figure 2 contains a first knife 21 that grasps underneath the sod to be harvested 3 that will be referred to from here onwards as the harvesting knife. This knife 21 is adjustable and is equipped with an electronically controlled depth control mechanism that contains two operating rods 23,24 and means of adjustment in the form of an actuator 25. The actuator 25 contains a hydraulic cylinder, but instead of an adjusting cylinder that is possibly hydraulic, an electrical spindle or another type of linear-operated medium can also be used. The actuator thus acts as a hinge around a pivot 253 on a first of two operating rods 23 that acts as a hinge around a pivot 233 and is

-8-

connected with a part of a frame 20 of the device. The actuator 25 itself is also hinged on the other side of this rod 23 around a pivot 255 and connected to the frame. Transverse to the first operating position, a second of two operating rods 24 is hinged around a pivot 244 and connected to the first operating rod while this second operating rod supports the harvesting
5 knife on its associated free end. Thus the harvesting knife 21 will move downwards if a piston rod 251 of the adjusting cylinder extends, and will be forced upwards if the piston rod 251 retracts. This allows the depth of the harvesting knife 21, and the subsequent thickness of the sod s 3 to be harvested, to be controlled relatively accurately by electrical means.

10 In order to prevent the sod from creeping upwards while it is being cut away by the harvesting knife on the underside, a relatively heavy drum 30 rolls over the field 3 beside the harvesting knife 21 so that the sod is enclosed between the drum 30 and the knife 21. A conveyor belt 6 is located behind the harvesting knife 21 for guiding the harvested sod before it is carried away to the unloading bay 7.

15 The device also has a second knife 22 for chopping the sod when it reaches the desired length. This knife 22 is capable of chopping transverse to the longitudinal direction of the sod and thus chopping in a single action. This knife, that will also be referred to from here onwards as the chopping knife, rests under considerable spring tension on a cam disc 42 by a spring 41
20 that is secured to a rotation axis 422. The cam disc 42 is linked to the drum via a chain drive 44 that is only schematically represented in the figure, with the medium of an electrically controlled clutch 45. The clutch 45 and the cam disc 42 are mutually adjusted so that the chopping knife 22 is always directly forced back to its highest position after the chopping of a sod , as shown in the figure. In this position, the clutch 45 disengages the drive 44 so that the
25 chopping knife remains rigidly in this position until the clutch is activated and the cam disc is driven over this highest point. In that case, the spring tension of the spring 41 ensures that the chopping knife will separate the harvested sod almost instantaneously from the next sod .

30 The device in this example is equipped with a fully automatic and accurately adjustable control for the length and thickness of the sod . This control incorporates a set of electronic sensors

-9-

that are housed in an integrated unit that, as such, can be installed as a finished factory product or at a later date on a sod harvesting device. This unit is shown in detail in various stages in figures 3A and 3B and first of all contains an electronic sensor 80 that is located near to a conveyor track 6 for receiving the sod , and is capable of recording the length of a passing sod 3 and producing this as an electronic value. In this case, this sensor 80 incorporates a measuring wheel 81 that is capable of resting on a passing sod 3 and being driven by it. For this, the measuring wheel 81 is incorporated in a common suspension 85 that is linked and hinged to a pivot 855 with a fixed part 200 of the chassis of the device. This suspension 85 rests under its own weight with the measuring wheel on a passing sod 3, as shown in figure 3B. This enables the measuring wheel 81 to be driven. A rotation sensor 82 in the form of an incremental pulse generator is linked to an end of an associated hub. This produces a series of pulses for each revolution of the measuring wheel. Each pulse represents a sod length $l=2\pi r/n$ where r is the radius of the measuring wheel and n is the number of pulses per rotation. In this case, a pulse generator is used that, in addition to detecting the rotation of the measuring wheel, also detects its direction of rotation, so that in the event of rotation in the opposite direction, a corresponding length is subtracted from the measuring result. Thus the length of a passing sod 3 is accurately derived from the number of pulses from the pulse generator. The pulse generator is linked by electronic means to a central processing unit 100 that in turn is linked to the electrical clutch 45. The central processing unit 100 incorporates an input means in the form of a numerical keyboard 101 and a checking window 102 that can be used to numerically set the desired sod length. When the desired length is reached, the central processing unit sends a signal to the clutch 45 that in turn re-engages the chain drive 44 to the cam disc 42 so that the chopping knife 22 is released and almost instantaneously chops the sod to the desired length. The processing unit also incorporates a manual switch 103 in the form of a pushbutton that enables the operator to operate the chopping knife 22 at any desired moment and to chop the sod 3. This is for example desirable if a visual inspection by the operator establishes that the quality of the sod is inferior, so harvesting of the good sod s can be resumed immediately after passing this part.

-10-

In order to prevent the sensor from continuing to count when a sod 3 is not present in the conveyor track 60, the unit contains an additional means of detection to detect whether or not a sod is present in the conveyor track 60. This means of detection incorporates an electrical switch 90 that is capable of operating in conjunction with the sensor 80. In the situation shown in figure 3A, where a sod is not present underneath the measuring wheel 81, the full weight of the sensor 80 rests on the switch 90 so that it is depressed. However, as soon as a sod passes underneath the measuring wheel 81 (see figure 3B), the sensor is raised from this point of departure and the switch is released. Thus the position of the switch provides an indication of whether or not a sod 3 is present in the conveyor track, with it being possible for this to be electronically detected, which can be supplied to the central processing unit 100 that is linked to the switch. If the switch 90 is depressed, the central processing unit 100 will temporarily stop measuring the length, and will resume this task immediately after the switch has been released. Thus measuring errors resulting from interruptions between consecutive sod s, or from the first sod to be harvested, are prevented.

Moreover, the unit incorporates a means for measuring a thickness of a freshly harvested sod 3 and to possibly feed this information back to the depth controller 25 for the harvesting knife 21. This means incorporates a raise detector that records the amount by which the sensor 80 is raised. The raise detector consists of a slide resistor 95,96 that is located between the sensor 80 and the part 201 of the chassis and also contains the switch 90. The slide resistor consists of a housing 95 in which a sliding electrode slides over a wound resistance element. As the sensor is raised by a passing sod from the point of departure shown in figure 3A, this electrode 96 will move further into the housing so that the resistance decreases. A virtually linear relationship exists between the amount by which the sensor is raised and the resistance of the slide resistor, so that this resistance provides a relatively direct indication of the actual thickness of the sod . If the measured thickness deviates at any moment from a value programmed via the input means, then the central processing unit will send a signal to the actuator requesting it to compensate for the deviation so that fully automatic thickness control is possible.

-11-

In order to ensure that the relatively vulnerable resistance element 95 cannot become damaged if the sensor is raised further than the sliding electrode allows, the part of the chassis 201 against which the sliding electrode 96 rests is separately hinged around a pivot 210 connected to the chassis 200. A stop (not illustrated) is located between this part 201 and the sensor so that when the sliding electrode 96 reaches the end of its travel in the resistance housing 95, this part 201 is raised by the sensor 80 in order to prevent mechanical overloading of the slide resistor 95,96. This situation is shown in figure 3C.

By way of an example, figure 5 shows a switching diagram as it is implemented by the central processing unit. The horizontal axis always shows the progress of time. Line A on figure 5 vertically shows the length of the sod as it is detected by the sensor 80. At the moment t_0 , the device is activated and harvesting is commenced. At moment t_1 , the first sod arrives at the sensor 80 so that this is raised and releases the switch 90. This is the signal for the central processing unit 100 to start a length measurement based on the pulses that are provided by the pulse generator 82 of the sensor. In order to reach a sod length P1, upon reaching a length P1-P2, a signal pulse is given by the processing unit 100 to the electrical clutch 45 in order to release the chopping knife 22. In this respect, P2 is the lateral distance between the sensor 80 and the chopping knife 22. This chopping signal to the clutch 45 is shown on line E in figure 5. In the meantime, the slide resistor 95 constantly monitors the thickness of the sod 3.

After the chopping signal has been given, the sensor continues to count for a period (t_s) until the actual length (P1) has been reached, after which a reset pulse (see figure D) is given to reset the length measurement to zero. Then the next measurement starts for the next sod, at least when a sod is detected underneath the sensor. As long as this is not the case, which can be seen from the position of the switch 90 that is schematically shown on line C of figure 5, the length measurement for the next sod will be postponed. Line B in figure 5 schematically shows the presence of the sod. Thus by unlinking the starting of new counting from the chopping signal, measurement only takes place if a sod is actually present and the system is able to cope with interruptions between successive sods. In the figure, this is the case during the periods tx_1 and tx_2 .

-12-

Thus the invention provides a sod harvesting device that controls the harvesting virtually completely automatically and can thus be operated in practice by only one operator. All of the sensors used for this are housed in a compact unit that can be easily installed as a finished factory product or at a later date on an existing device. The central processing unit with its
5 operating means is for example housed in the cabin of the device.

Whilst the invention for this has only been explained in more detail purely based on an example of an embodiment, it will be evident that the invention is in no way restricted to this. On the contrary, many variants and representations of the invention are possible for an
10 average tradesman.

-13-

Claims:

1. Sod harvesting device, comprising a mobile chassis with a first knife (21) that is capable of cutting a sod (3) free from a field and a second knife (22) that is capable of cutting
5 off the sod in a direction that is transverse to the direction of travel, whereby the second knife is equipped with actuation means (42,44,45) which cause the second knife to work into the sod when a desired sod length has been reached and where transport means (6) are present near the first knife to receive the cut away sod and to carry it away, characterised in that an electronic sensor (81,82) is installed near a conveyor track (6) for the sod , which is capable
10 of recording at least a measure for a length of passing sod and of producing this as an electronic signal and in that the sensor is linked by electronic means to the actuation means for the second knife in order to release the second knife upon reaching a predetermined sod length.
2. Device according to claim 1 characterised in that the sensor is linked to the actuation
15 means (42,44,45) via a central processing unit (100).
3. Device according to claim 2 characterised in that the electronic sensor contains a measuring wheel (81) to rest on and to be driven by a passing sod , and that a sensor (82) linked to the measuring wheel records a rotation of the measuring wheel and produces an electronic signal
- 20 4. Device according to claim 3 characterised in that the sensor (82) is capable of recording a rotation direction of the measuring wheel (81).
5. Device according to claim 3 or 4 characterised in that the sensor includes an incremental pulse generator.
6. Device according to one of the aforementioned claims characterised in that electronic
25 detection means (90) are applied to record the presence of a sod in the conveyor track (6) and to produce this as an electronic signal.
7. Device according to claim 6 characterised in that the sensor is freely suspended in a direction essentially transverse to the conveyor track for the sod in order to be raised from a point of departure when a sod passes, and in that the detection means are linked to a
30 suspension of the sensor.

-14-

8. Device according to claim 7 characterised in that the means of detection comprise an electronic switch (90) that is capable of cooperating with the suspension of the sensor (80), at least on leaving its point of departure.

5 9. Device according to one of the aforementioned claims characterised in that means (95,96) are installed next to a conveyor track for the sod in order to determine the thickness of the sod and to produce this as an electronic value.

10 10. Device according to claim 9 characterised in that the sensor is freely suspended in a direction transverse to the conveyor track and in that the means for determining the thickness of the sod comprise a raise detector that is capable of recording an amount of raising of the sensor and producing this as an electronic value.

11. Device according to claim 10 characterised in that the raise detector contains a slide resistor that is linked to the sensor.

15 12. Device according to one of the aforementioned claims characterised in that the first knife (21) is adjustable and is equipped with adjustment means (23,24,25) that can be controlled by a central processing unit (100).

13. Device according to claim 12 characterised in that the means of adjustment contains an electronically controlled actuator (25) connected to the first knife.

20 14. Device according to one of the aforementioned claims characterised in that the electronically controlled mechanisms for the second knife (22) contains an electronic clutch (45) that is incorporated in a transmission between a drive (44) for the chassis and a cam disc (42) on which the second knife rests under spring (41) pressure.

10/031060

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

RECORD COPY

For rec Office use only

PCT/NL International Application No. 00/00500

International Filing Date (17. 07. 00) 17 JUL 2000

BUREAU VOOR DE INDUSTRIËLE EIGENDOM
P.O.T. INTERNATIONAL APPLICATION

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) 99.1097 WO

Box No. I TITLE OF INVENTION

Inrichting voor het oogsten van gewaszoden

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

VAN LOEN TECHNIEK B.V.
Astronaut 40
3824 MJ Amersfoort
The Netherlands

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:

NL

State (that is, country) of residence:

NL

This person is applicant for the purposes of:

☐ all designated States☒ all designated States except the United States of America☐ the United States of America only☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

VAN LOEN, Leonardus Lambertus
Zevenhuizenstraat 136
3828 PV Hoogland
The Netherlands

This person is:

☐ applicant only☒ applicant and inventor☒ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

NL

State (that is, country) of residence:

NL

This person is applicant for the purposes of:

☐ all designated States☐ all designated States except the United States of America☒ the United States of America only☐ the States indicated in the Supplemental Box☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☐ agent☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

VISSER-LUIRINK; Gezina
Octrooibureau LIOG
P.O. Box 13363
NL-3507 LJ Utrecht

Telephone No.

+ 31 302305020

Facsimile No.

+ 31 302305030

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

See Notes to the request form

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes, at least one must be marked):

Regional Patent

- ☒ **AP ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|---|---|
| <input checked="" type="checkbox"/> AE United Arab Emirates | <input checked="" type="checkbox"/> LC Saint Lucia |
| <input checked="" type="checkbox"/> AG Antigua and Barbuda | <input checked="" type="checkbox"/> LK Sri Lanka |
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LR Liberia |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AT Austria | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MA Morocco |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BZ Belize | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> MZ Mozambique |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CR Costa Rica | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CZ Czech Republic | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> DE Germany | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DK Denmark | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> DM Dominica | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> DZ Algeria | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> EE Estonia | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> FI Finland | <input checked="" type="checkbox"/> SK Slovakia |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GD Grenada | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TZ United Republic of Tanzania |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IN India | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> ZA South Africa |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | |
| <input checked="" type="checkbox"/> KR Republic of Korea | |
| <input checked="" type="checkbox"/> KZ Kazakhstan | |

Check-box reserved for designating States which have become party to the PCT after issuance of this sheet:



Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claim indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application:* regional Office	international application: receiving Office
item (1) 16 July 1999 (16/07/99)	1012614	NL		
item (2)				
item (3)				

☐ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s):

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA)
(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA /

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year)

Number

Country (or regional Office)

31 March 2000

SN 33638

NL

EPO

(31/03/00)

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following number of sheets:

request : 3

description (excluding
sequence listing part) : 13

claims : 3

abstract : 21

drawings : 4

sequence listing part
of description : 24

Total number of sheets : 24

This international application is accompanied by the item(s) marked below:

1. ☒ fee calculation sheet

2. ☐ separate signed power of attorney

3. ☐ copy of general power of attorney; reference number, if any:

4. ☐ statement explaining lack of signature

5. ☐ priority document(s) identified in Box No. VI as item(s):

6. ☐ translation of international application into (language):

7. ☐ separate indications concerning deposited microorganism or other biological material

8. ☐ nucleotide and/or amino acid sequence listing in computer readable form

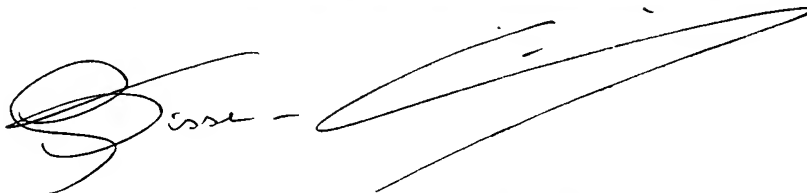
9. ☐ other (specify):

Figure of the drawings which
should accompany the abstract: 3 B

Language of filing of the
international application: NL

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).



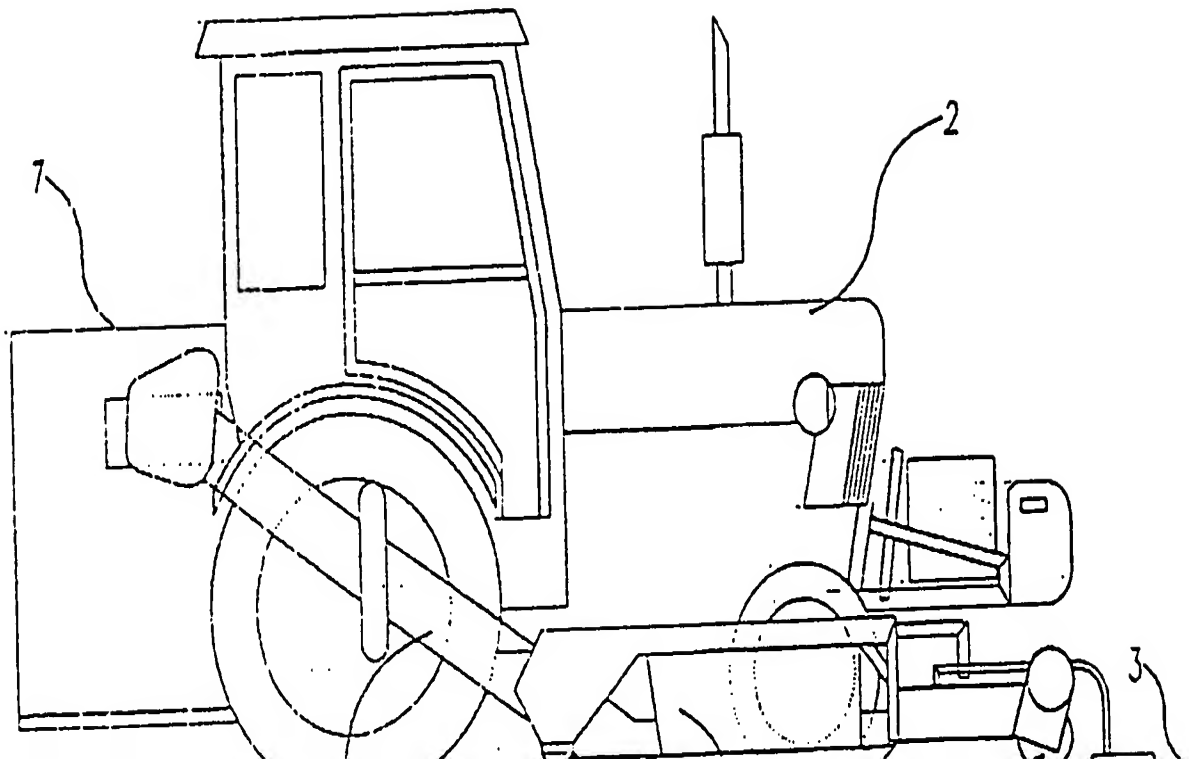
G. Visser-Luirink

For receiving Office use only		2. Drawings: <input checked="" type="checkbox"/> received: <input type="checkbox"/> not received:
1. Date of actual receipt of the purported international application:	17 JUL 2000 (17.07.00)	
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent): ISA /	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

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Date of receipt of the record copy by the International Bureau:	11 AUGUST 2000 (11.08.00)

1/4

JNL 00/00500



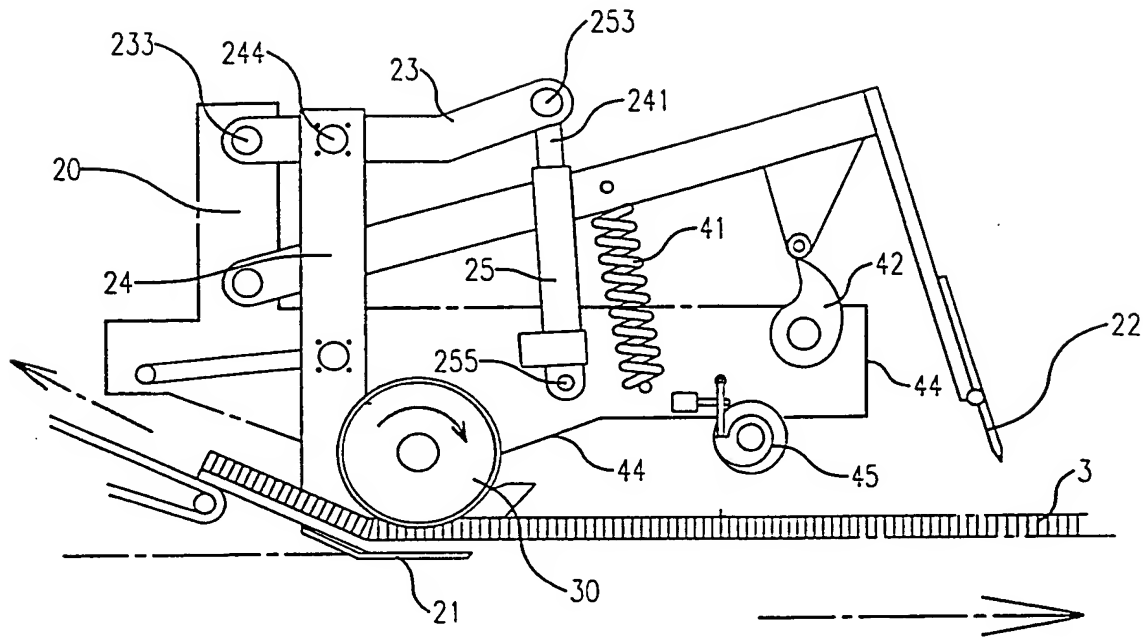


Fig.2

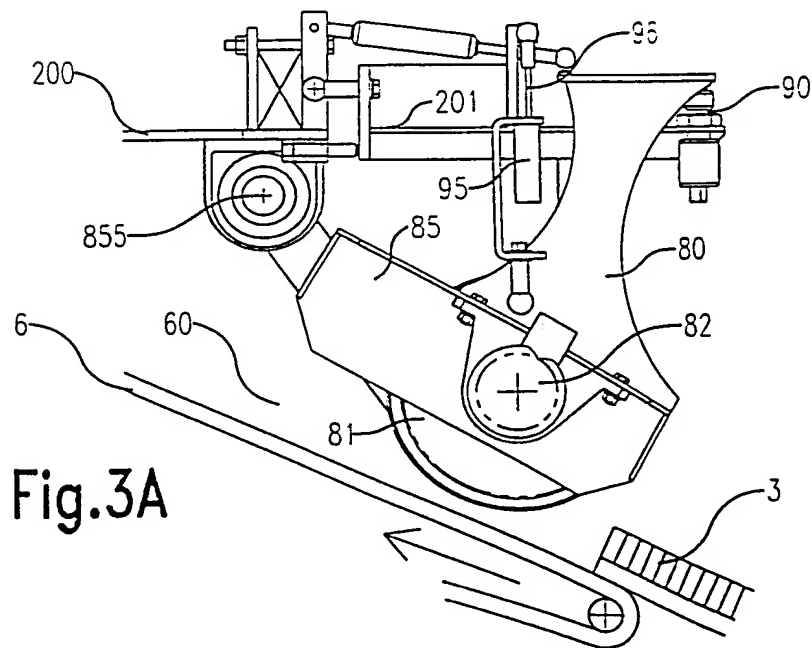
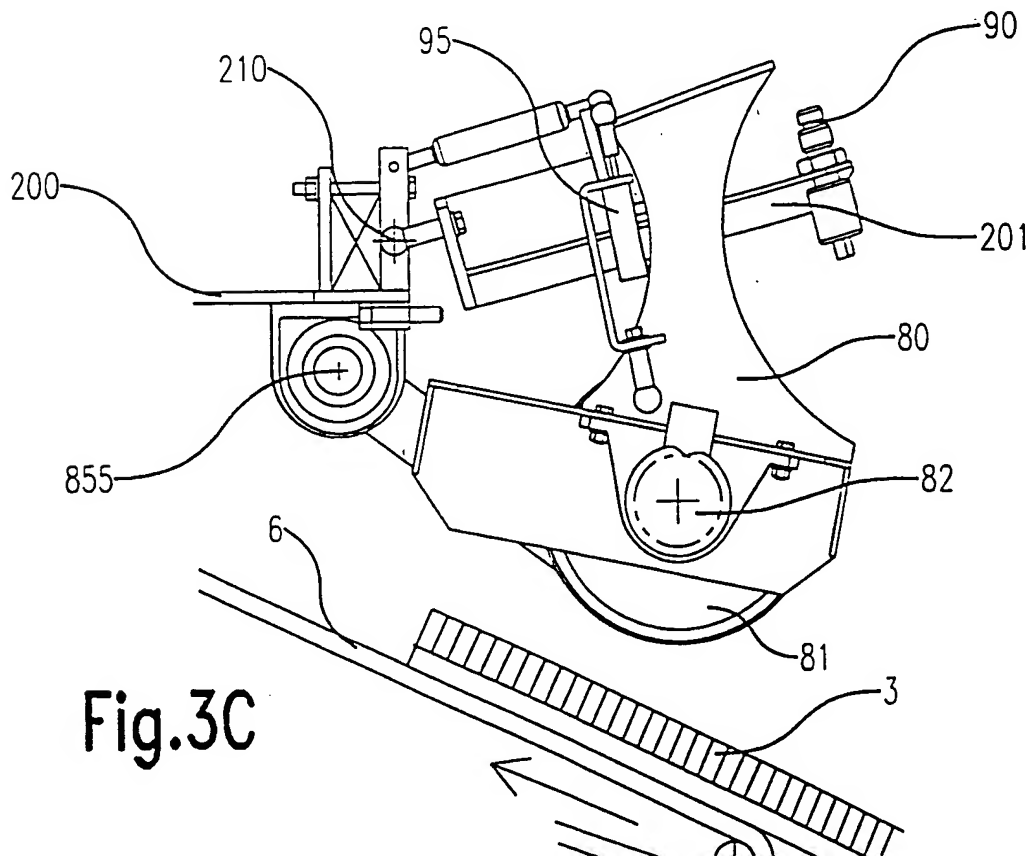
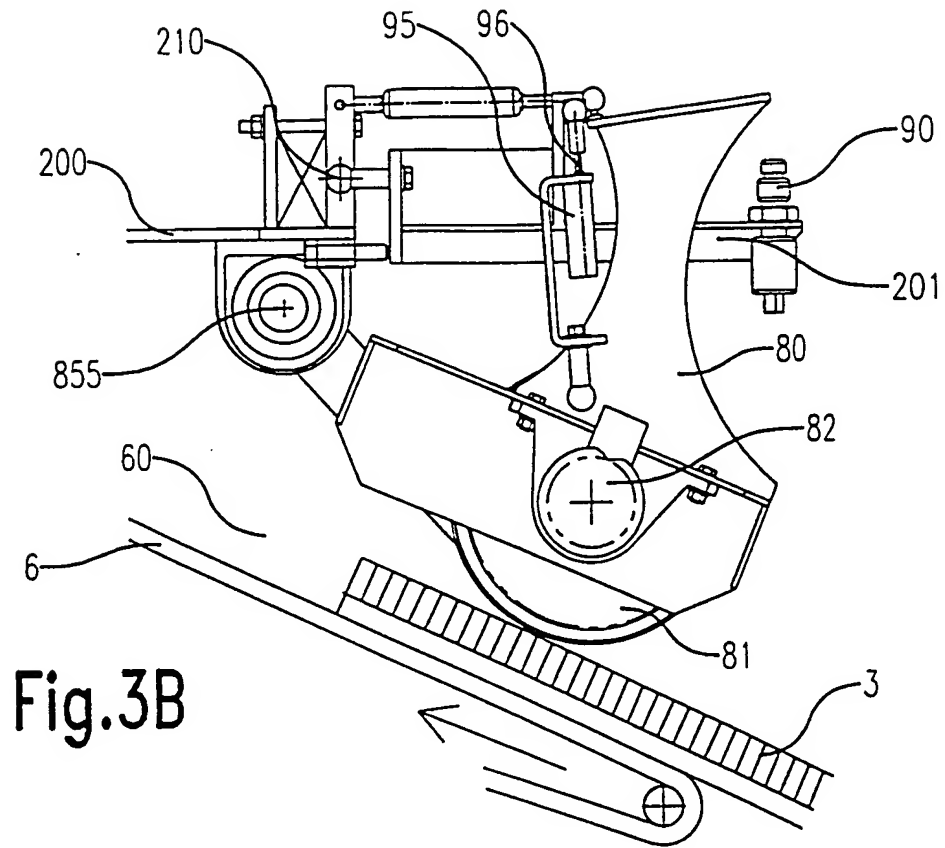


Fig.3A



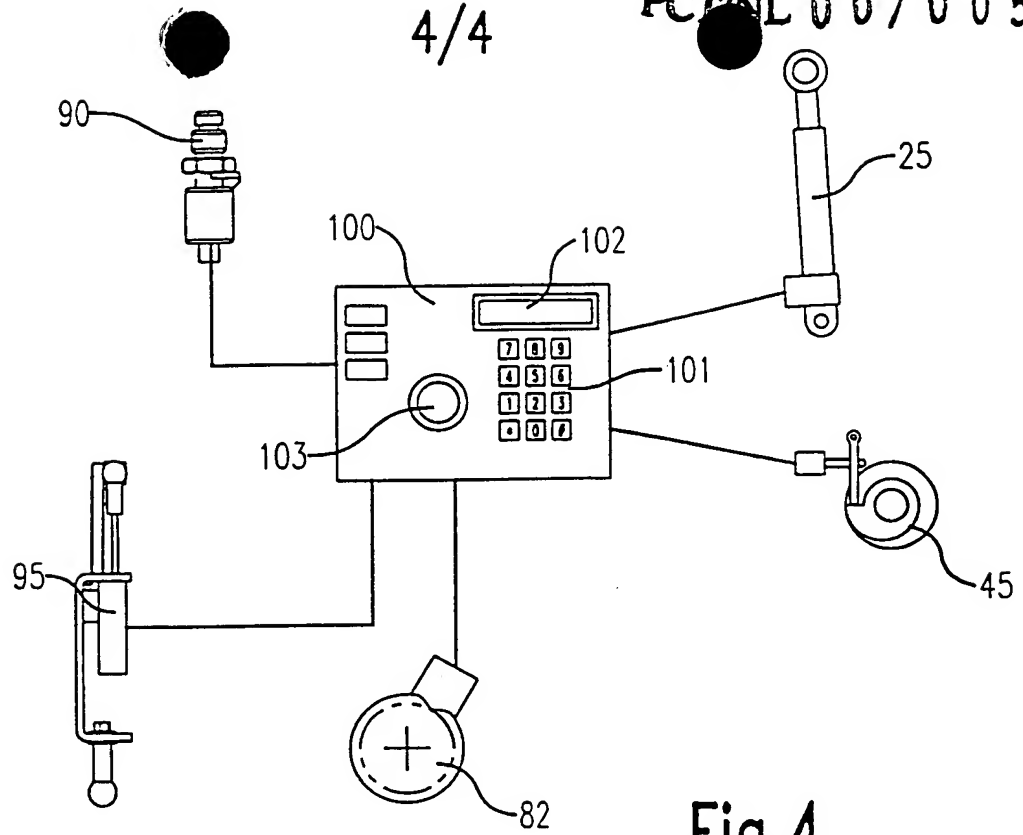


Fig. 4

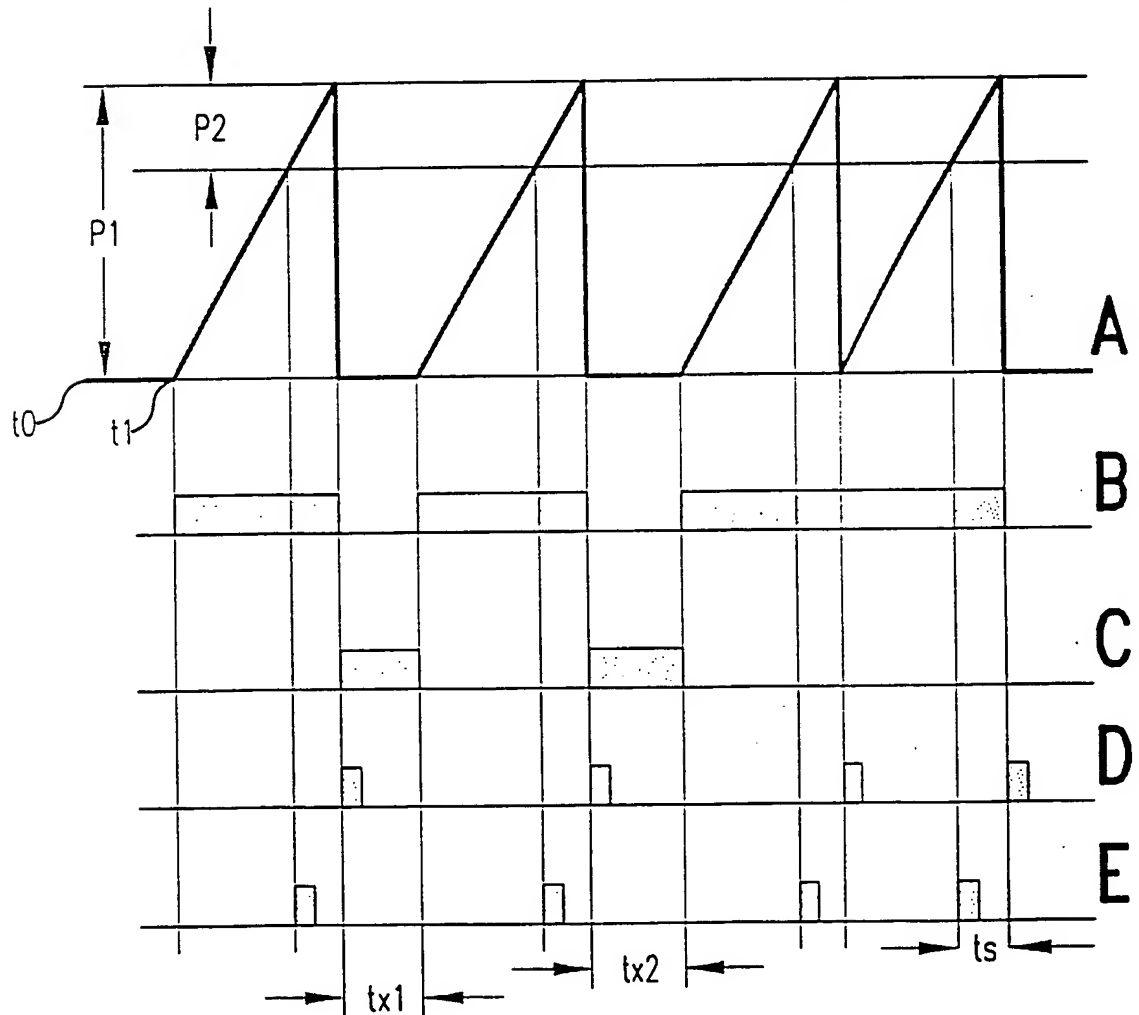


Fig. 5

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FEE CALCULATION SHEET Annex to the Request

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PCT/NL

00/00500

International application No.

17 JUL 2000

17.07.00

Date stamp of the receiving Office

Applicant's or agent's
file reference

Applicant

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE 110,00 T

2. SEARCH FEE 2082,00 S

International search to be carried out by EP
(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee

The international application contains 17 sheets.

first 30 sheets 901,00 b1

remaining sheets x additional amount = 910,13 b2

Add amounts entered at b1 and b2 and enter total at B 901,00 B

Designation Fees

The international application contains 78 designations.

number of designation fees x amount of designation fee payable (maximum 8) = 1544,00 1465, D

Add amounts entered at B and D and enter total at I 2445,00 2375,58 I

(Applicants from certain States are entitled to a reduction of 25% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

4. FEE FOR PRIORITY DOCUMENT (if applicable) 20,00 P

5. TOTAL FEES PAYABLE 4637,00 4588,09

Add amounts entered at T, S, I and P, and enter total in the TOTAL box

TOTAL

☐ The designation fees are not paid at this time.

MODE OF PAYMENT

☒ authorization to charge
deposit account (see below)

☐ bank draft

☐ coupons

☐ cheque

☐ cash

☐ other (specify):

☐ postal money order

☐ revenue stamps

DEPOSIT ACCOUNT AUTHORIZATION (this mode of payment may not be available at all receiving Offices)

The RO/ NL ☒ is hereby authorized to charge the total fees indicated above to my deposit account.

☒ (this check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit) is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

☒ is hereby authorized to charge the fee for preparation and transmittal of the priority document to the International Bureau of WIPO to my deposit account.

1470

17/07/2000

Deposit Account No.

Date (day/month/year)

Signature

Inrichting voor het oogsten van gewaszoden.

De onderhavige uitvinding heeft betrekking op een inrichting voor het oogsten van gewaszoden omvattende een verrijdbaar gestel met een eerste mes dat in staat is om een gewaszode van een veld los te snijden en met een tweede mes dat in staat is om de gewaszode in een richting dwars op een rijrichting af te snijden, waarbij het tweede mes is voorzien van bekrachtigingsmiddelen die bij het bereiken van een gewenste zodelengte het tweede mes op de gewaszode laten inwerken en waarbij nabij het eerste mes transportmiddelen aanwezig zijn om daarop de losgesneden gewaszode te ontvangen en af te voeren.

Een dergelijke inrichting vindt met name toepassing voor het oogsten van graszoden. Een bekende inrichting voor het oogsten van graszoden omvat een al of niet zelfrijdend gestel dat aan een voorzijde, gezien in de rijrichting, een eerste mes omvat om een graszode op een bepaalde breedte en dikte van het veld los te snijden. Het mes grijpt daarbij tot de gewenste dikte onder het maaiveld, terwijl ter plaatse van het mes een wals over het veld rolt om de gewaszode tussen het mes en de wals in te sluiten opdat een gelijkmatige dikte wordt bereikt. De inrichting omvat voorts een tweede mes dat in werking treedt nadat aldus de graszode over de gewenste lengte is losgesneden, om de gewaszode dwars op de lengterichting af te snijden. De aldus tot de gewenste lengte geoogste gewaszode wordt achter het eerste mes naar transportmiddelen in de vorm van een lopende band geleid en daarmee afgevoerd. Inmiddels wordt een volgende graszode alweer losgesneden.

De bekende inrichting werkt in zekere mate automatisch doordat het tweede mes onder een beduidende veerspanning op een nokkenschijf afsteunt en steeds bij een omwenteling daarvan wordt vrijgegeven, waarbij de nokkenschijf door een kettingoverbrenging aan de wals is gekoppeld. Hierdoor wordt precies na een voorafbepaald aantal omwentelingen van de wals het tweede mes bekrachtigd en de geoogste gewaszode afgesneden. Een bezwaar hiervan is evenwel dat de overgang naar een andere gewaszodelengte een betrekkelijk ingrijpende omstelling van de inrichting

behoeft doordat daarvoor een andere tandwielverhouding in de kettingoverbrenging dient te worden gerealiseerd. In de praktijk betekent dit dat de bestaande tandwielen dienen te worden verwijderd om plaats te maken voor andere tandwielen. Dit kost niet alleen tijd, waarbij de inrichting buiten bedrijf is, maar is bovendien betrekkelijk grof
5 doordat uitsluitend lengtes kunnen worden toegepast die passen bij een specifieke tandwielverhouding. In de praktijk is het evenwel vaak gewenst om betrekkelijk nauwkeurig de lengte van de graszode bij te stellen om ervoor te zorgen dat de diameter van een tot een rol gewikkelde zode nagenoeg constant is. Indien tijdens het oogsten, omwille van de ondergrond, wordt overgegaan op een andere diepte van het eerste mes
10 houdt dit in dat daarbij tevens een andere lengte dient te worden gekozen om die diameter gelijk te houden. Met de bekende inrichting is dit niet of nauwelijks realiseerbaar.

Bovendien is de bekende inrichting betrekkelijk onnauwkeurig doordat niet zelden de
15 wals zal slippen onder de weerstand die de wals ondervindt in de kettingoverbrenging en de beperkte wrijving over het veld. Hierdoor zal de geoogste gewaszode een grotere lengte verkrijgen dan bedoeld. Dit is sowieso het geval met de gewaszode die na het inwerking treden van de inrichting als eerste wordt geoogst. Door de afstand tussen de wals en het tweede mes zal deze zode onvermijdelijk over deze afstand te lang worden
20 geoogst, wat vervolgens handmatig dient te worden gecorrigeerd en tot uitval van het bewuste gewaszodedeel leidt.

Met de onderhavige uitvinding wordt ondermeer beoogd in een inrichting van de in de aanhef genoemde soort te voorzien die deze nadelen niet of nauwelijks kent en meer in
25 het bijzondere een fijnafrekening van de oogstlengte van de gewaszode toelaat.

Om het beoogde doel te bereiken heeft een inrichting van de in de aanhef genoemde soort volgens de uitvinding als kenmerk dat een elektronische opnemer nabij een transportbaan van de gewaszode is aangebracht welke in staat is om althans een maat
30 voor een lengte van een passerende gewaszode te registreren en als elektronische weg d

af te geven en dat de opnemer langs elektronische weg is gekoppeld aan de bekrachtigingsmiddelen van het tweede mes om bij het bereiken van een vooraf bepaalde gewaszodelengte het tweede mes vrij te geven. Aldus voorziet de uitvinding in een opnemer die direct of indirect de lengte van de passerende gewaszode meet, dit in
5 tegenstelling tot de bekende inrichting waarbij de rotatie van de wals primair een verplaatsing van de inrichting als geheel representeert. Aldus zal bij de inrichting volgens de uitvinding de als eerste geoogste gewaszode op gelijke wijze worden behandeld als de opvolgende gewaszoden. Doordat gemeten wordt na het oogsten, in plaats van ervoor zoals bij de bekende inrichting, is de inrichting volgens de uitvinding
10 bovendien minder gevoelig voor rek en krimp van de geoogste zoden die een gevolg kunnen zijn van een snelheidsverschil tussen de afvoersnelheid van de transportmiddelen en de rijsnelheid van de inrichting als geheel. Conform de uitvinding kan de lengte van de graszode worden geregistreerd zoals de graszode uiteindelijk wordt afgeleverd. Doordat de uitvinding uitgaat van een elektronische opnemer en dito
15 overbrenging naar het tweede mes, kan nagenoeg wrijvingsvrij worden gemeten en de gewaszodelengte elektronisch op ieder gewenste maat worden afgesteld, zonder dat daarvoor de inrichting buiten bedrijf behoeft te worden genomen.

Een voorkeursuitvoeringsvorm van de inrichting volgens de uitvinding heeft daarbij als
20 kenmerk dat de opnemer door tussenkomst van een centrale verwerkingseenheid aan de bekrachtigingsmiddelen is gekoppeld. De centrale verwerkingseenheid biedt de mogelijkheid om tevens rekening te houden met tal van andere relevante parameters, zoals de actuele dikte van de gewaszode, opdat een optimaal eindproduct wordt verkregen.

In een bijzondere uitvoeringsvorm is de inrichting volgens de uitvinding gekenmerkt

gemeten, waardoor en bijzonder nauwkeurig meetresultaat wordt verkregen. Dit meetresultaat wordt ter verdere verwerking aan de centrale verwerkingseenheid afgegeven.

- 5 Een voorkeursuitvoeringsvorm van de inrichting heeft daarbij als kenmerk dat de sensor in staat is om een rotatierichting van het meetwiel te registreren. Doordat de sensor in staat is om niet alleen een rotatie, maar tevens een rotatierichting van het meetwiel vast te stellen, kan rekening worden gehouden met voor- en achteruit rijden en eventuele schokken in het transport van de gewaszode opdat de uiteindelijke lengte van de
- 10 gewaszode daardoor onverlet wordt gelaten. Een bijzondere uitvoeringsvorm van de inrichting volgens de uitvinding is in dit opzicht gekenmerkt doordat de sensor een incrementele pulsgever omvat.

- Een verdere voorkeursuitvoeringsvorm van de inrichting volgens de uitvinding heeft als
- 15 kenmerk dat elektronische detectiemiddelen zijn aangebracht om de aanwezigheid van een gewaszode in de transportbaan te registreren en als elektronische waarde af te geven. Hierbij wordt niet alleen een lengte van de geoogste gewaszode gemeten, maar bovendien ook separaat de aanwezigheid van een gewaszode in de transportbaan vastgesteld en als elektronisch signaal afgegeven. Met name indien niet op de
- 20 gewaszode zelf, maar indirect de lengte van de geoogste gewaszode wordt bepaald, kan aldus worden gecorrigeerd voor die gevallen of perioden waarbij een gewaszode in de transportbaan ontbreekt. Dit is met name relevant voor een lengtecorrectie van de als eerste geoogste gewaszode en voor een correctie voor gapingen tussen opvolgende gewaszoden als gevolg van opgetreden rek en krimp zoals hiervoor omschreven.

- 25 In een bijzondere uitvoeringsvorm heeft de inrichting volgens de uitvinding in laatstgenoemd verband als kenmerk dat de opnemer in een richting in hoofdzaak dwars op de transportbaan van de gewaszode gangbaar is opgehangen om bij passage van een gewaszode uit een uitgangspositie te worden gelicht en dat de detectiemiddelen aan een
- 30 ophanging van de opnemer zijn gekoppeld. Deze uitvoeringsvorm voorziet op een

betrekkelijk eenvoudige doch niet minder doelmatige wijze in een registratie van de al of niet aanwezigheid van een gewaszode. Zodra een gewaszode ontbreekt, zal de ophanging naar de uitgangspositie terug keren en daarbij de detectiemiddelen beroeren, die dit als elektronisch signaal afgeven. In een verdere uitvoeringsvorm is de inrichting volgens de uitvinding daarbij gekenmerkt doordat de detectiemiddelen een elektrische schakelaar omvatten die in staat is om samen te werken met de ophanging van de opnemer, althans bij het verlaten van diens uitgangspositie.

Omdat gewaszoden na het oogsten veelal tot een rol worden verwerkt van een bij voorkeur constante diameter is niet alleen de lengte van een gewaszode van belang maar speelt ook de dikte daarvan een rol. Met het oog hierop is een verdere voorkeursuitvoeringsvorm van de inrichting volgens de uitvinding gekenmerkt doordat nabij een transportbaan van de gewaszode middelen zijn aangebracht om een dikte van een geoogste gewaszode vast te stellen en als elektronische waarde af te geven.

In een verdere uitvoeringsvorm is de inrichting volgens de uitvinding gekenmerkt doordat de opnemer in een richting dwars op de transportbaan gangbaar is opgehangen en dat de middelen voor het vaststellen van de dikte van de gewaszode een lichtingsdetector omvatten die in staat is een mate van lichting van de opnemer te registreren en als elektronische waarde af te geven. De mate van lichting geeft een maat voor de actuele dikte van de gewaszode en kan als zodanig als elektronische waarde worden afgegeven, bijvoorbeeld aan een centrale verwerkingseenheid. Aldus kan volautomatisch rekening worden gehouden met diktevariaties van de gewaszoden, opdat eenmaal tot een rol gewikkeld een constante diameter wordt bereikt. In een verdere bijzondere uitvoeringsvorm heeft de inrichting volgens de uitvinding daarbij als kenmerk dat de lichtingsdetector een schuifweerstand omvatten die aan de opnemer is gekoppeld. De lichting van het meetwiel leidt daarbij tot een overeenkomstig in- of

Een verdere uitvoeringsvorm van de inrichting volgens de uitvinding heeft als kenmerk dat het eerste mes verstelbaar is en is voorzien van verstelmiddelen die door een centrale verwerkingseenheid aanstuurbaar zijn. Aldus kan niet alleen de lengte van de gewaszode elektronisch worden geregeld, maar is tevens een elektronische diktereregeling mogelijk en daarmee een elektronische koppeling tussen beide om de uiteindelijke diameter van een tot een rol gewikkeld product constant te houden. Aldus wordt een bijzonder gebruiksvriendelijk systeem bereikt waarvoor in de praktijk niet meer dan één operateur nodig is.

De verstelmiddelen kunnen op zichzelf op verscheidene wijze worden gerealiseerd, zoals door tussenkomst van een regelbare drukcilinder, hydraulisch of pneumatisch. Een in de praktijk zichzelf bewezen uitvoeringsvorm van de inrichting volgens de uitvinding heeft in dit opzicht als kenmerk dat de verstelmiddelen een elektronisch aanstuurbare actuator omvatten waaraan het eerste mes is gekoppeld. De actuator kan bijvoorbeeld een spindel zijn die door een elektrische stappenmotor wordt aangedreven of een al of niet hydraulische verstelcilinder. In beide gevallen kan het eerste mes daarmee nauwkeurig op de gewenste diepte in te stellen.

Ook de elektronische bekrachtiging van het tweede mes is op zichzelf op diverse wijzen uitvoerbaar. Een verdere bijzondere uitvoeringsvorm van de inrichting volgens de uitvinding heeft evenwel als kenmerk dat de bekrachtigingsmiddelen van het tweede mes een elektrische koppeling omvatten die is opgenomen in een overbrenging tussen een aandrijving van het gestel en een nokkenschijf waarop het tweede mes onder veerkracht afsteunt. Zodra de koppeling wordt bekrachtigd zal de nokkenschijf worden aangedreven en het tweede mes vrijgeven zodat de gewaszode wordt afgesneden. Dit kan bijvoorbeeld vanuit een centrale verwerkingseenheid worden aangestuurd.

De uitvinding zal thans nader worden toegelicht aan de hand van een uitvoeringsvoorbeeld en een bijbehorende tekening. In de tekening toont:

- figuur 1 een zijaanzicht van een uitvoeringsvorm van de inrichting volgens de uitvinding;
- figuur 2 een dwarsdoorsnede door een eerste deel van de inrichting van figuur 1;
- figuur 3A een dwarsdoorsnede door een tweede deel van de inrichting van figuur 1
5 in een eerste toestand;
- figuur 3B een dwarsdoorsnede door een tweede deel van de inrichting van figuur 1 in een tweede toestand;
- figuur 3C een dwarsdoorsnede door een tweede deel van de inrichting van figuur 1 in een derde toestand;
- 10 figuur 4 een schematische weergaven van een elektronisch circuit van de inrichting van figuur 1; en
- figuur 5 een schakeldiagram van het circuit van figuur 4.

De figuren zijn zuiver schematisch en niet op een gelijke schaal getekend. Met name zijn omwille van de duidelijkheid sommige dimensies sterk overdreven weergegeven.

15 Overeenkomstige delen zijn in de figuren zoveel mogelijk met eenzelfde verwijzingscijfer aangeduid.

In figuur 1 is een inrichting weergegeven voor het oogsten van gewaszoden in de vorm van een verrijdbaar gestel 1 dat aan een bestaande tractor 2 is gekoppeld. Als alternatief
20 kan de inrichting ook zelf-rijdend worden uitgevoerd, in welk geval de tractor en de inrichting een onderling geïntegreerd geheel vormen. De te oogsten gewaszoden liggen in een veld 3 en worden voor het oogsten vrij gemaakt van blad en ander afval door middel een roterende borstelrol 5. De inrichting voorziet bovendien in een zij-geleiding 4 die verend afsteunt tegen een rand van het maaiveld en is gekopeld aan de
25 stuurinrichting van de inrichting. Aldus is de inrichting zelfstandig in staat koers te houden langs de rand van een volgende baan te oogsten gewaszoden en kan de gehele inrichting door slechts één operateur volledig worden bediend. Ten behoeve van het oogsten omvat de inrichting 1 een tweetal messen die zijn ondergebracht binnen de beplating van de inrichting en in figuur 2 in meer detail zijn weergegeven. De daarmee
30 geoogste gewaszoden worden met behulp van transportmiddelen in de vorm van een

lopende band 6 naar een tijdelijke opslag plaats 7 afgevoerd, van waar de zoden worden gelost. In de praktijk worden de zoden daarbij tot rollen van een min of meer vaste diameter gewikkeld en op de losplaats op een pallet gestapeld. Nadat het pallet volledig vol is wordt het van de inrichting genomen om op het veld te worden geplaatst, dan wel
5 direct te worden afgevoerd.

Het stel messen dat in figuur 2 in dwarsdoorsnede is weergegeven omvat een eerste mes 21 dat onder de te oogsten gewaszode 3 grijpt en navolgend zal worden aangeduid als het oogstmes. Dit mes 21 is verstelbaar en voorzien van een bekrachtigde diepteregeling
10 die een tweetal bedieningsstangen 23,24 omvat en verstelmiddelen in de vorm van een actuator 25. de actuator 25 omvat hier een hydraulische verstelcilinder. maar in plaats van een al of niet hydraulische verstelciliner kan overigens ook een elektrische spindel of een andersoortige lineair opererend orgaan worden toegepast. De actuator 25 werk daarbij scharnierend om een scharnieras 253 in op een eerste van beide
15 bedieningsstangen 23 die scharnierend om een scharnier as 233 met een deel van een frame 20 van de inrichting is verbonden. De actuator 25 is aan de van deze stang 23 afgewende zijde ook zelf scharnierend om een scharnieras 255 met het frame verbonden. Dwars op de eerste bedieningsstand is een tweede van beide
bedieningsstangen 24 scharnierend om een scharnieras 244 met de eerste
20 bedieningsstang verbonden terwijl deze tweede bedieningsstang aan het vrije uiteinde daarvan het oogstmes draagt. Aldus zal het oogstmes 21 neerwaartst bewegen indien een zuigerstang 251 van de verstelcilinder 25 wordt uitgedreven en juist opwaartst worden geforceerd indien de zuigerstang 251 zich terug trekt. Hiermee kan betrekkelijk nauwkeurig de diepte van het oogstmes 21 elektrisch worden geregeld en daarmee de
25 dikte van de te oogsten gewaszoden 3.

Om te vermijden dat de gewaszode 3 opkruipt terwijl het door het oogsmes aan de onderzijde wordt losgesneden, rolt een betrekkelijk zware wals 30 ter plaatse van het

ge oogste gewaszode wordt geleid om vervolgens naar het losstation 7 te worden afgevoerd.

Om de gewaszode 3 bij het bereiken van de gewenste lengte af te snijden, beschikt de
 5 inrichting tevens over een tweede mes 22 dat in staat is om dwars op de lengterichting
 van de gewaszode in te werken en die aldus in één keer af te snijden. Dit in het
 navolgende als hakmes aangeduide mes wordt door een veer 41 onder een beduidende
 veerspanning afgesteund op een nokkenschijf 42 die roteerbaar om een rotatieas 422 is
 bevestigd. De nokkenschijf 42 is via een in de figuur slechts schematisch weergegeven
 10 kettingoverbrenging 44 gekoppeld aan de wals, onder tussenkomst van een elektrisch
 bekrachtigbare koppeling 45. De koppeling 45 en de nokkenschijf 42 zijn dusdanig op
 elkaar ingesteld dat het hakmes 22 steeds na het afsnijden van een gewaszode direct
 naar zijn hoogste stand wordt gedreven, welke in de figuur is aangeduid. In deze stand
 ontkoppeld de koppeling 45 de overbrenging 44 zodat het hakmes in deze stand op
 15 scherp blijft staan totdat de koppeling wordt bekrachtigd en de nokkenschijf over dit
 hoogste punt wordt gedreven. De veerkracht van de veer 41 zorgt er in dat geval voor
 dat het hakmes vrijwel ogenblikkelijk de ge oogste gewaszode zal separeren van een
 opvolgende gewaszode.

20 De inrichting van dit voorbeeld is voorzien van een volautomatische en nauwkeurig
 instelbare regeling voor de lengte en dikte van de gewaszode. Deze regeling omvat een
 stel elektronische opnemers die zijn ondergebracht in een geïntegreerde unit die als
 zodanig zowel af fabriek als achteraf op een inrichting voor het oogsten van
 gewaszoden is te plaatsen. Deze unit is in figuur 3A-3B in onderscheiden stadia in detail
 25 weergegeven en omvat allereerst een elektronische opnemer 80 die nabij een
 transportbaan 60 van de gewaszode is geplaatst en die in staat is om de lengte van een
 passerende gewaszode 3 te registreren en als elektronische waarde af te geven. In dit
 geval omvat deze opnemer 80 een meetwiel 81 dat in staat is om op een passerende

met een vast deel 200 van het gestel van de inrichting is verbonden. Deze ophanging 85 steunt onder zijn eigen gewicht met het meetwiel af op een passerende gewaszode 3, zoals in figuur 3B is aangegeven. Daarbij zal het meetwiel 81 worden aangedreven. Op een uiteinde van een naaf daarvan is een rotatiesensor 82 gekoppeld in de vorm van een incrementele pulsgever. Deze geeft per omwenteling van het meetwiel een geheel aantal pulsen af. Iedere puls staat daarbij voor een gewaszodelengte $\ell = 2\pi r/n$, waarbij r de straal van het meetwiel en n het aantal pulsen per rotatie daarvan weergeeft. In dit geval wordt een pulsgever toegepast die behalve de rotatie van het meetwiel tevens diens rotatierichting te detecteren, zodat bij een tegengestelde rotatie een overeenkomstige lengte van het meetresultaat wordt afgetrokken. Aldus is uit het aantal pulsen van de pulsgever de lengte van een passerende gewaszode 3 nauwkeurig bekend. De pulsgever is langs elektronische weg gekoppeld aan een centrale verwerkingseenheid 100 die op zijn beurt is gekoppeld aan de elektrische koppeling 45. De centrale verwerkingseenheid 100 omvat invoermiddelen in de vorm van een numeriek toetsenbord 101 en een controlevenster 102 waarmee de gewenste gewaszodelengte numeriek kan worden ingesteld. Bij het bereiken van de gewenste lengte, geeft de verwerkingseenheid een signaal af aan de koppeling 45 die op zijn beurt de kettingoverbrenging 44 naar de nokkenschijf 42 herstelt zodat het hakmes 22 wordt vrijgegeven en vrijwel ogenblikkelijk de geoogste gewaszode op de gewenste lengte afsnijdt. De verwerkingseenheid beschikt daarnaast over een handschakelaar 103 in de vorm van een drukknop die de operator de mogelijkheid geeft op ieder gewenst moment het hakmes 22 in werking te stellen en de gewaszode 3 af te snijden. Dit is bijvoorbeeld gewenst indien de operator bij een visuele inspectie vaststelt dat de gewaszodekwaliteit lokaal onder de maat is opdat juist na het passeren van dit deel opnieuw met oogsten van goede gewaszoden kan worden begonnen.

Om te vermijden dat de opnemer doortelt wanneer ter plaatse überhaupt geen gewaszode 3 in de transportbaan 60 aanwezig is, omvat de unit veredre

-11-

90 die in staat is om samen te werken met de opnemer 80. In de in figuur 3A getoonde situatie, waarbij geen gewaszode onder het meetwiel 81 aanwezig is, rust de opnemer 80 met zijn volle gewicht op de schakelaar 90 zodat deze is ingedrukt. Zodra een gewaszode 3 echter onder het meetwiel 81 terecht komt, zie figuur 3B, wordt de opnemer uit deze uitgangspositie gelicht en wordt de schakelaar vrij gegeven. Aldus levert de toestand van de schakelaar een indicatie van de al of niet aanwezigheid van een gewaszode 3 in de transportbaan die elektronisch kan worden vastgesteld en als zodanig aan de centrale verwerkingseenheid 100 waarmee de schakelaar is verbonden kan worden afgegeven. Indien de schakelaar 90 is ingedrukt, zal de verwerkingseenheid 100 de lengtemeting staken om deze voort te zetten eerst nadat de schakelaar weer vrij is. Aldus worden meetfouten als gevolg van onderbrekingen tussen opvolgende gewaszoden en bij de als eerste geoogste gewaszode vermeden.

Voorts bevat de unit middelen om een dikte van de zojuist geoogste gewaszode 3 te meten en eventueel terug te koppelen naar de diepteregeling 25 van het oogstmes 21. Deze middelen omvatten hier een lichtingsdetector om de mate van lichting van de opnemer 80 te registreren. De lichtingsdetector wordt gevormd door een schuifweerstand 95,96 die tussen de opnemer 80 en het deel 201 van het gestel is aangebracht dat ook de schakelaar 90 omvat. De schuifweerstand omvat een huis 95 met daarin een gewonden weerstandselement waarover een schuifelektrode 96 glijdt. Naarmate de opnemer door een passerende gewaszode verder uit de uitgangstoestand van figuur 3A wordt gelicht, zal deze elektrode 96 verder in het huis treden waardoor de weerstand afneemt. Hierbij geldt een nagenoeg lineair verband tussen de mate van lichting en de weerstand van de schuifweerstand, waardoor deze weerstand een betrekkelijk directe maat is voor de actuele dikte van de gewaszode. De schuifweerstand is aan de centrale verwerkingseenheid 100 gekoppeld om deze weerstand als elektronische waarde voor de dikte van de gewaszode daaraan af te geven. Mocht de aldus gemeten dikte op neig moment afwijken van een via de invoermiddelen geprogrammeerde waarde, dan zal de centrale verwerkingseenheid een signaal afgeven

aan de actuator 25 om de afwijking te compenseren zodat een volautomatische diktecontrole mogelijk is.

Om ervoor te zorgen dat het betrekkelijk kwetsbare weerstandselement 95 niet kan
5 beschadigen indien de opnemer verder wordt opgelicht dan de schuifelektrode toelaat, is
het deel van het gestel 201 waartegen de schuifelektrode 96 afsteunt afzonderlijk
scharnierend om een scharnieras 210 met het gestel 200 verbonden. Tussen dit deel 201
en de opnemer is een niet nader weergegeven stop aangebracht zodanig dat bij het
bereiken van de uiterste stand van de schuifelektrode 96 in het weerstandshuis 95 dit
10 deel 201 door de opnemer 80 mee wordt opgelicht om zo een mechanische
overbelasting van de schuifweerstand 95,96 te vermijden. Deze situatie is in figuur 3C
weergegeven.

Figuur 5 toont bij wijze van voorbeeld een schakeldiagram zoals dat door de centrale
15 verwerkingseenheid wordt uitgevoerd. De horizontale as geeft daarbij steeds het verloop
in de tijd aan. Schema A geeft verticaal de gewaszodelengte weer zoals die door de
opnemer 80 vastgesteld. Op het moment t_0 wordt de inrichting in bedrijf genomen en
wordt begonnen met oogsten. Op tijdstip t_1 arriveert de eerste gewaszode bij de opnemer
80 zodat deze wordt opgelicht en de schakelaar 90 vrijgeeft. Dit is voor de centrale
20 verwerkingseenheid 100 het signaal om met een lengtemeting te beginnen op basis van
de pulsen die dan door de pulsgever 82 van de opnemer worden afgegeven. Om een
gewaszodelengte P_1 te bereiken wordt bij het bereiken van een lengte P_1-P_2 door de
verwerkingseenheid 100 aan de elektrische koppeling 45 een signaalpuls afgegeven om
het hakmes 22 vrij te geven. Hierbij is P_2 de laterale afstand tussen de opnemer 80 en
25 het hakmes 22. Dit haksignaal aan de koppeling 45 wordt aangegeven in schema E.
Onderwijl wordt voortdurend de dikte van de gewaszode 3 door de schuifweerstand 95
gecontroleerd.

Nadat het haksignaal is gegeven, telt de opnemer nog gedurende een tijd t_s door totdat
30 werkelijk de gewenste lengte P_1 is bereikt, waarna een resetpuls, zie schema D, wordt

gegeven om de lengtemeting weer op nul te stellen. Vervolgens start de volgende meting voor de volgende gewaszode, althans mits een gewaszode onder de opnemer wordt gedetecteerd. Zolang dit niet het geval is, wat is af te lezen aan de toestand van de schakelaar 90 die in schema C schematisch wordt weergegeven, zal de meting van
5 lengte van de volgende gewaszode worden uitgesteld. In schema B is schematisch de aanwezigheid van de gewaszode aangegeven. Door aldus het starten van een nieuwe telling los te koppelen van het haksignaal wordt telkens uitsluitend gemeten indien daadwerkelijk een gewaszode aanwezig is en is het systeem robuust voor onderbrekingen tussen opvolgende gewaszoden. In de figuur is dit het geval gedurende
10 de tijdspannen tx1 en tx2.

Aldus voorziet de uitvinding in een inrichting voor het oogsten van gewaszoden die nagenoeg volautomatisch het oogsten bestuurd en daardoor in de praktijk door slechts een enkele operateur kan worden bediend. Alle daarvoor gebruikte opnemers zijn
15 ondergebracht in een compacte unit die zich eenvoudig laat monteren zowel af fabriek als later achteraf op een bestaande inrichting. De centrale verwerkingseenheid met zijn bedieningsmiddelen wordt bijvoorbeeld in de cabine van de inrichting ondergebracht.

Hoewel de uitvinding hiervoor aan de hand van louter een enkel uitvoeringsvoorbeeld
20 nader werd verduidelijkt, zal het duidelijk zijn dat de uitvinding geenszins daartoe is beperkt. Integendeel zijn voor een gemiddelde vakman binnen het kader van de uitvinding nog vele variaties en verschijningsvormen mogelijk.

Conclusies:

1. Inrichting voor het oogsten van gewaszoden omvattende een verrijdbaar gestel met een eerste mes dat in staat is om een gewaszode van een veld los te snijden en met
5 een tweede mes dat in staat is om de gewaszode in een richting dwars op een rijrichting af te snijden, waarbij het tweede mes is voorzien van bekrachtigingsmiddelen die bij het bereiken van een gewenste zodelengte het tweede mes op de gewaszode laten inwerken en waarbij nabij het eerste mes transportmiddelen aanwezig zijn om daarop de losgesneden gewaszode te ontvangen en af te voeren met het kenmerk dat een
10 elektronische opnemer nabij een transportbaan van de gewaszode is aangebracht welke in staat is om althans een maat voor een lengte van een passerende gewaszode te registreren en als elektronische waarde af te geven en dat de opnemer langs elektronische weg is gekoppeld aan de bekrachtigingsmiddelen van het tweede mes om bij het bereiken van een vooraf bepaalde gewaszodelengte het tweede mes vrij te geven.

15

2. Inrichting volgens conclusies 1 met het kenmerk dat de opnemer door tussenkomst van een centrale verwerkingseenheid aan de bekrachtigingsmiddelen is gekoppeld.

20

3. Inrichting volgens conclusie 2 met het kenmerk dat de elektronische opnemer een meetwiel omvat om op een passerende gewaszode af te steunen en daardoor te

6. Inrichting volgens een der voorafgaande conclusies met het kenmerk dat elektronische detectiemiddelen zijn aangebracht om de aanwezigheid van een gewaszode in de transportbaan te registreren en als elektronische waarde af te geven.
- 5 7. Inrichting volgens conclusie 6 met het kenmerk dat de opnemer in een richting in hoofdzaak dwars op de transportbaan van de gewaszode gangbaar is opgehangen om bij passage van een gewaszode uit een uitgangspositie te worden gelicht en dat de detectiemiddelen aan een ophanging van de opnemer zijn gekoppeld.
- 10 8. Inrichting volgens conclusie 7 met het kenmerk dat detectiemiddelen een elektrische schakelaar omvatten die in staat is om samen te werken met de ophanging van de opnemer, althans bij het verlaten van diens uitgangspositie.
- 15 9. Inrichting volgens een der voorafgaande conclusies met het kenmerk dat nabij een transportbaan van de gewaszode middelen zijn aangebracht om een dikte van een geoogste gewaszode vast te stellen en als elektronische waarde af te geven.
- 20 10. Inrichting volgens conclusie 9 met het kenmerk dat de opnemer in een richting dwars op de transportbaan gangbaar is opgehangen en dat de middelen voor het vaststellen van de dikte van de gewaszode een lichtingsdetector omvatten die in staat is een mate van lichting van de opnemer te registreren en als elektronische waarde af te geven.
- 25 11. Inrichting volgens conclusie 10 met het kenmerk dat de lichtingsdetector een schuifweerstand omvatten die aan de opnemer is gekoppeld.
12. Inrichting volgens een der voorgaande conclusies met het kenmerk dat het eerste mes verstelbaar is en is voorzien van verstelmiddelen die door een centrale verwerkingseenheid aanstuurbaar zijn.

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-16-

13. Inrichting volgens conclusie 12 met het kenmerk dat de verstelmiddelen een elektronisch aanstuurbare actuator omvatten waaraan het eerste mes is gekoppeld.
14. Inrichting volgens een der voorgaande conclusies met het kenmerk dat de
- 5 bekrachtigingsmiddelen van het tweede mes een elektrische koppeling omvatten die is opgenomen in een overbrenging tussen een aandrijving van het gestel en een nokkenschijf waaraan het tweede mes onder veerkracht afsteunt

Uittreksel:

Inrichting voor het oogsten van gewaszoden.

- 5 Een inrichting voor het oogsten van gewaszoden (3) omvattende een verrijdbaar gestel (1) met een eerste mes (21) dat in staat is om een gewaszode van een veld los te snijden en met een tweede mes (22) dat in staat is om de gewaszode in een richting dwars op een rijrichting af te snijden. Het tweede mes is voorzien van bekrachtigingsmiddelen (41,42,45) die bij het bereiken van een gewenste zodelengte het tweede mes op de
10 gewaszode laten inwerken op de gewaszode af te snijden. Een elektronische opnemer (80,81,82) is nabij een transportbaan (60) van de gewaszode aangebracht en in staat om althans een maat voor een lengte van een passerende gewaszode te registreren en als elektronische waarde af te geven. De opnemer is langs elektronische weg gekoppeld aan de bekrachtigingsmiddelen van het tweede mes om bij het bereiken van een vooraf
15 bepaalde gewaszodelengte het tweede mes vrij te geven.

Fig. 3B